Chesapeake Bay TMDL Analysis

For Frederick County, Maryland

July 16, 2012

TMDL Analysis for Frederick County, Maryland

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Disclaimer

This document is provided by staff for information only and does not represent a Local Area Plan or a local TMDL Watershed Implementation Plan. Maryland's Watershed Implementation Plan (WIP) for the Chesapeake Bay TMDL is a guidance document with nonbinding targets at the County level. The document is an evaluation at the staff level and does not constitute approval or endorsement from any level of management at Frederick County Government. Frederick County Government is held to conditions in its NPDES permits and will address actual requirements through the established permit adoption process. Staff avoids speculating as to the sufficiency of legal obligations in future permits that have not been issued. The attainability of the plan is not possible to determine at this time. Frederick County reserves the right to evaluate the TMDL and WIP requirements for attainability and seek adjustments as warranted.

Final Phase II WIP

MDE's Phase II WIP Targets

MDE submitted the "Maryland Phase II WIP Strategies: Frederick" scenario to EPA on March 30, 2012 as part of its draft Phase II WIP submission. Frederick County Government has chosen to not modify MDE's scenario. It represents one modeled scenario to address MDE's target reductions for Frederick County, Maryland. Other scenarios could be developed in the future.

Frederick County expresses gratitude to MDE for putting the resources into the development of this tool, which permits the County to model different water quality scenarios.

Some observations made about MDE's plan that could be addressed in the future:

- MDE increases some numbers for BMPs from 2010- 2017 but reduces them from 2017-2025 though the numbers are said to be cumulative. Per Tom Thornton of MDE in communications with the Center for Watershed Protection, numbers are reduced when MDE runs out of land for new practices and must reduce less efficient practices to meet nutrient reductions:

  "For Developed Land, SW BMPs cannot be applied to more than 100% of the available Urban land. During the valuation of submitted scenarios and applying BMPs to meet the targets it was found that in some cases there was not enough available land for all of the input. Given this there were instances when a less effective BMP was reduced such as Dry Ponds or the By ERA BMP. This is what in some jurisdictions what is actually happening, the conversion of less effective Dry Ponds being converted to Wet Ponds."

  Since many of these BMPs represent large financial obligations and 20 year lifespans, it does not seem appropriate to implement a BMP and then turn around a few years later and eliminate it or convert it to a different practice. It is also a concern that there is not enough land to apply BMPs to meet the Bay TMDL.

- MDE relies heavily on the use of a "natural filters" BMP for stormwater that has a very marginal nutrient removal efficiency per unit of area.

- Use of just a few BMPs from the larger suite of options would limit options for local governments, who develop plans to meet individual site conditions.
- The BMPs chosen do not appear to reflect the most cost-effective solutions per unit of impervious area treated.

Costs of MDE's "Maryland Phase II WIP Strategies: Frederick" Scenario

The costs in Table 1 are expected to be for all entities in Frederick County, including the County, municipalities, state and federal government, and nonregulated areas. The actual breakdown of costs for each entity is not available because the data was not available at that scale. The County is able to estimate the costs to the County Government as shown in Table 2 separate from other entities using calculations described in later sections. Note also that plans for two Federal facilities, The U.S. Army's draft Phase II submission for Fort Detrick and the National Guard's draft Phase II submission for the Frederick Armory are included as Appendix F and G.

MDE implies large financial commitments from the County in the future that have not been adopted by the local governing body. As noted above, the WIP is a guidance document, and the County's requirements will be written into its permits; thus, Frederick County Government cannot make promises as to future financial obligations at this time. With these caveats, Frederick County calculated costs for MDE's "Maryland Phase II WIP Strategies: Frederick". Note Frederick County was unable to estimate the costs of the agricultural portion of the plan, as these have not been released by MDA. Frederick County calculated costs for sewer using available data, but notes that the results are not authoritative.

Table 1: Costs for all of Frederick County by Sector

Sector	2010-2017 Increment	2017-2025 Increment	2010-2025 Total
Stormwater	$790,179,732	$713,270,376	$1,503,450,109
Septics	$0	$165,144,000	$165,144,000
Agriculture	Requested from MDA	Requested from MDA	Requested from MDA
Wastewater	$209,358,338	$10,300,000	$219,658,338
Total Stormwater, Septics and Sewer	**$999,538,070**	**$888,714,376**	**$1,888,252,447**

Table 2: Costs for Frederick County Government's portion of the WIP by Sector

Sector	2010-2017 Increment	2017-2025 Increment	2010-2025 Total
Stormwater	$342,938,004	$309,559,343	$652,497,347
Septics	$0	$165,144,000	$165,144,000
Agriculture	Requested from MDA	Requested from MDA	Requested from MDA
Wastewater	$118,000,000	$0	$118,000,000
Total Stormwater, Septics and Sewer	**$460,938,004**	**$474,703,343**	**$935,641,347**

Cost of Wastewater Treatment

Frederick County Projects

Ballenger-McKinney WWTP

The Ballenger-McKinney WWTP Facility Plan recommended the construction of improvements to expand the existing 6.0 MGD Biological Nutrient Removal (BNR) treatment facility to 15 MGD, starting with an immediate 1.0 MGD increase in the BNR facility capacity. The 1.0 MGD increase in capacity was designed, permitted and with construction completed in

May 2009. Coincident to this initial increase in capacity, the County designed, bid and is now constructing a phased 8.0 MGD increase in Ballenger-McKinney WWTP, which includes ENR levels of treatment for the 15 MGD design capacity (capacity beyond 7.0 MGD).

The existing plant upgrade to Enhanced Nutrient Removal for the Ballenger-McKinney plant is projected to be the main cost to meet TMDL standards, in the budgeted amount of $118,000,000. It is noted that the costs to upgrade this plant include additional capacity. Breakout of projected costs for the Ballenger McKinney plant as confirmed by Kevin Demosky of Frederick County's Division of Utilities and Solid Waste Management:

- State ENR Grant: $30,741,060
- State Loan (County): $61,000,000
- ARRA Loan (County): $6,000,000
- Local Funds: City of Frederick: $14,873,944, County: $5,619,844.

The WWTP project is reflected in the May 2012 BayStat "Bay Restoration Fund Targeted Wastewater Treatment Plants" report.

City of Frederick Projects

The City of Frederick includes its obligations to the Ballenger-McKinney WWTP, Gas House Pike (Frederick) WWTP upgrades, and Inflow and Infiltration Reductions in its Capital Improvement Program, as seen below in Table 3. Gene Walzl of the City confirmed that the ENR project did not expand capacity, and that the entire project is designed to improve water quality. The I/I projects are not included in costs in Table 4 because they are "designed to address water quantity rather than water quality", per Gene. Costs of I/I reduction typically run the City between 300-500K per year, and $5.0M has been approved for I/I to date according to the CIP.

Table 3: City of Frederick, MD Sewer Projects Reproduced from Capital Improvement Program FY'13-FY'18

	PRJ. NO.	PROJECT NAME	TOTAL PROJECT	TOTAL CITY SHARE REQUIRED	CITY SHARE APPROVED TO DATE	CITY SHARE ONLY FY 13	FY 14	FY 15	FY 16	FY 17	FY 18
		SEWER									
	370003	Shookstown Interceptor Sewer	805,157	805,157	898,000	(92,843)	0	0	0	0	0
	370007	Wastewater Flowmeter Replacement	1,070,000	1,070,000	320,000	550,000	200,000	0	0	0	0
	370008	Gas House Pk. WWTP Expansion & Imp'ts.	9,893,143	9,877,649	20,373,551	(10,495,902)	0	0	0	0	0
	370009	Ballenger-McKinney WWTP	17,483,000	17,483,000	17,483,000	0	0	0	0	0	0
x	370010	Gas House Pk WWTP Solids Proc Rehab	6,017,883	3,029,270	0	3,029,270	0	0	0	0	0
x	370011	Gas House Pk WWTP ENR Upgrade	47,368,100	27,689,980	0	27,689,980	0	0	0	0	0
	370300	Inflow and Infiltration Reduction	5,691,837	5,478,267	4,978,267	500,000	0	0	0	0	0
		Total Water and Sewer Fund:	216,425,070	192,115,914	133,585,475	23,630,439	24,200,000	2,000,000	3,600,000	2,600,000	2,500,000
		Debt Funding		(168,214,153)	(127,186,910)	(19,927,243)	(20,500,000)	0	(600,000)	0	0
		Special Assessments		(2,786,840)	(2,490,735)	(296,105)	0	0	0	0	0
		Impact Fees		0	0	0	0	0	0	0	0
		Pay-As-You-Go		21,114,921	3,907,830	3,407,091	3,700,000	2,000,000	3,000,000	2,600,000	2,500,000

Town of Emmitsburg Projects

David Haller from the Town of Emmitsburg shared the costs of Emmitsburg WWTP BNR and ENR upgrades as well as sewer line projects that included actions to remediate Infiltration and Inflow (I/I) issues. WWTP upgrades are reflected in Table 4. The WWTP project is also reflected in the May 2012 BayStat "Bay Restoration Fund Targeted Wastewater Treatment Plants" report. I/I projects and sewer line upgrades include South Seton Ave Sewer Line and Lincoln Avenue Sewer Line projects that cost roughly $2.6M.

Town of Thurmont Projects

Bill Blakeslee from the Town of Thurmont shared the costs of its WWTP as reflected in Table 4. According to Bill, Thurmont is spending $2M on I/I projects. According to the Bay Restoration Fund, Thurmont was also awarded $947K on a sewer line upgrade.

City of Brunswick Projects

Richard Weldon from the City of Brunswick shared the costs of its WWTP project as reflected in Table 4. The WWTP project is reflected in the May 2012 BayStat "Bay Restoration Fund Targeted Wastewater Treatment Plants" report. Brunswick has also spent roughly $400K to improve I/I; this cost is not reflected in Table 4.

Funding Wastewater treatment

The information in Table 4 below was obtained from Bay Restoration Fund Annual Reports. The accuracy of the information provided is not guaranteed, and it is noted that a comprehensive and authoritative accounting of costs for WWTP, sewer line, and other wastewater-related upgrades in Frederick County could not be found. It should be considered a work in progress.

Table 4: Sewer projects contributing to Nutrient Reductions with Construction Dates and Costs from the Bay Restoration Fund Annual Reports

Project	Est. N Reduction from Upgrade (lbs)	Est. P Reduction from Upgrade (lbs)	Start Date Const.	Target Date Const. Complete	Actual Date Const. Complete	% Const. Complete	BRF Share	Other Funding	Owner Share	Total Cost
Brunswick WWTP ENR	16,498	2,003	Complete	Complete	9/15/2008	Complete	$12,200,000	$0	$2,400,000	$14,600,000
Ballenger Creek WWTP ENR	64,246	27,305	12/14/2009	7/31/2015		50%	$31,000,000	$0	$87,000,000	$118,000,000
Emmitsburg WWTP BNR and ENR	18,576	2,256	7/1/2012	7/1/2014			$7,736,950	$1,501,355	$6,800,783	$16,039,088
Frederick WWTP ENR	78,742	33,465	12/2/2013	10/2/2015			$29,000,000	$0	$31,719,250	$60,719,250
Thurmont WWTP							$8,000,000	$0	$2,300,000	$10,300,000
Total							**$87,936,950**	**$1,501,355**	**$130,220,033**	**$219,658,338**

Cost of Septic Denitrification

In the case of septic denitrification, staff used an average of costs from four vendors that have systems approved by MDE as shown in Table 6. The average cost per unit is $12,000. Costs include 5 years O&M. MDE's 2017 interim strategy reflects no increase in septic denitrification from 2010. Its 2025 numbers reflect an increase of 13,762 denitrification systems from 2017 within 1000 feet of a perennial stream, as shown in Table 5 below. By extension, the cost of these systems would be $165,144,000. This does not include management of the program or electricity costs. The current program requires the services of 2FTE (1.75 Canaan Valley Institute staff plus 0.25 Frederick County staff). To go from upgrading 15 systems per year to approximately 1,058 per year suggests a need for significantly more staff to manage such a program. Furthermore, the citizen bears the cost of the increased electrical demand, which is estimated to be between $23-$273 per system per year. The electricity costs for 13,762 systems would be $316,526-$3,757,026 per year in perpetuity according to MDE's per unit costs in Table 6 multiplied by the number of systems. The MWh usage per year for the systems ranges between 2,386 and 28,883.

Using Potomac Edison's 2011 Environmental Information as an example, as most electricity use in the region is from this utility, electricity use would result in the yearly emissions of:

- 3.62 pounds of Sulfur Dioxide (SO_2) per megawatt-hour, or between 8,638 and 104,556 pounds for 13,762 systems
- 1.05 pounds of Nitrogen Oxides (NO_x) per MWh, or between 2,505 and 30,327 pounds for 13,762 systems
- 1,156.56 pounds of Carbon Dioxide (CO_2) per MWh, or between 2,759,552 and 33,404,922 pounds for 13,762 systems.

These unintended consequences of the use of septic denitrification systems reduce the effectiveness of nitrogen removal from the retrofits and contribute to air quality issues and greenhouse gas emissions.

Table 5: Septic System BMPs Reproduced from MDE's "Maryland Phase II WIP Strategies: Frederick"

			2010 Progress	2017 Interim Strategy	2025 Final Strategy
BMP Name	Zone	Unit			
Septic Denitrification	Critical Area	Systems	0	0	0
	Outside of the Critical Area, not within 1000 ft of a perennial stream	Systems	25	25	25
	Within 1000 ft of a perennial stream	Systems	22	22	13,784
	Septic DenitrificationTotal		***47***	***47***	***13,808***

Table 6: Four field verified BAT technologies in Maryland – Advantex, Hoot BNR, Norweco and Septitech from January 2012 Bay Restoration Fund Annual Report

Model	Contact Information	Certifications	MDE Field Performance Analysis for Total Nitrogen	Cost of Purchase, Installation and 5 Years Operation & Maintenance	Operation and Maintenance Cost per year*	Electricity cost and Usage**
Hoot BNR	**Manufacturer** Hoot Aerobic Systems, Inc. www.hootsystems.com **Local Distributor** Nancy Mayer Phone: (410) 796-1434 Email: mayerbro@connext.net	Other 3rd Party	Percent Removal 52% And Effluent Concentration 29 mg/l	$11,954	$250 to $325	$100/year or 2.1 kWh/day
Advan Tex®-AX	**Manufacturer** Orenco Systems®, Inc. www.orenco.com/ **Local Distributor** Robert Johnson Phone: 1-877-214-92837 Email: bjohnson@septicsystems.net	Other 3rd Party	Percent Removal 69% And Effluent Concentration 19 mg/l	$12,300	$175	$23/year or 0.475 kWh/day
Singulair TNT	**Manufacturer** Norweco, Inc. www.norweco.com **Local Distributors** Eastern Shore - John Short Phone: (443) 786-0594 Email: btowers62@gmail.com Southern Region - Jeff Earnshaw Phone: (301) 274-3772 Email: superiortank@olg.com Western Region - C.R. Semler (301) 824-2780 crsemler@crsemler.com Back River Pre-Cast LLC 12200 Owings Mills Blvd, #B Reisterstown, MD 21136 410-833-3394 Contact: Tony Geckle, Matt Geckle	Other 3rd Party And NSF 245	Percent Removal 50% And Effluent Concentration 35 mg/l	$11,079	$180 to $300	$273/year or 5.75 kWh/day
SeptiTech ®	**Manufacturer** SeptiTech, Inc. www.septitech.com **Local Distributors** Chris Wireman Phone: (443)-463-0637 Western MD, Scott Everhart Phone: (304) 676-3823	ETV And NSF 245	Percent Removal 59% And Effluent Concentration 24 mg/l	$13,056	$180 to $300	$242/year or 5.1 kWh/day

Funding Septic Denitrification

To date, Frederick County has received funding from the Bay Restoration Fund to upgrade 81 systems. It has upgraded an average of about 15 systems per year since the program's inception, and has used the maximum amount of funding that MDE has allocated for this purpose as shown in Table 7. There are obvious problems with the funding of this program. Furthermore, as these systems are not mapped, it is unclear if there are 13,762 systems within 1000 feet of a perennial stream. To go from upgrading 15 systems per year to approximately 1,058 per year suggests a need for significant additional staff to manage such a program. It is unclear of how this level of support would be funded. Electricity costs would be borne by the consumer and pollution externalities would be borne by the public. O&M costs after the first five years of Bay Restoration Fund assistance (assuming assistance for all upgrades) would be borne by the public.

Table 7: Funding from Bay Restoration Fund for Septic System Denitrification

Awardee	Year	Amount
Canaan Valley Institute (Frederick Co.)	Previous	$631,907.05
Canaan Valley Inst. (Fred. Co.)	FY'11	$200,000
Canaan Valley Inst. (Fred. Co.)	FY'12	$100,000

Frederick County will continue its program to upgrade systems with nitrogen-removing technology with the resources it is able to obtain through the BRF, but questions the cost-effectiveness of this practice per unit of nitrogen removed.

Cost of Stormwater Restoration Programs

Phase I MS4 Municipal Separate Storm Sewer System requirements are better established on a Maximum Extent Practicable (MEP) basis through the permitting process, rather than through an informal WIP submittal. That being said, The costs for stormwater from MDE's plan are calculated to be $1,503,450,109, including a cost from 2010-2017 of $790,179,732 and a cost from 2017-2025 of $713,270,376 as shown in Table 10. To calculate this cost, staff used BMPs from MDE's "Maryland Phase II WIP Strategies: Frederick" as shown in Table 8 and multiplied the number of units for each BMP by unit costs for impervious acres from King and Hagan (Appendix D), who prepared estimates for MDE to go with the Maryland Assessment Scenario Tool. To convert nonstructural practices from restoration acres in MDE's plan to impervious acres, staff used conversions from MDE's "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated" Document in Table 9 below. Notably, the impervious credit for many of these practices is heavily discounted.

Costs are 20-year costs at a net present value. BMPs include all future stormwater retrofits within Frederick County in Maryland's plan in Table 8, including municipal, state, federal, county-owned and unregulated urban land. It is estimated that the cost to Frederick County Government would be about 43.4% of this cost based on the proportion of the load reduction that MDE's WIP has targeted to Frederick County's MS4 Phase I permit for Nitrogen. This amounts to $652,497,347 by 2025.

Notably, the costs for stormwater from MDE's scenario using MDE's cost estimates are significantly greater than the $200M estimate provided by MDE in the past.

Funding Stormwater Restoration Programs

In Frederick County, $.01 on the tax bill raises approximately $2,500,000, per the Finance Division. From a tax perspective, if the $652M were split over 20 years at $32,624,867 per year, implementing stormwater retrofits to the 2025 deadline would be equivalent to raising the real property tax rate $0.13. If the $644M were split over 13 years at $50,192,103 per year, implementing stormwater retrofits to the 2025 deadline would be equivalent to raising the real property tax rate $0.20. If the County were to charge a flat fee for all eligible tax accounts and collect through the mandated fee collection system, the cost per tax account, assuming around 85,000 eligible accounts, would be roughly $383.82 per year for 20 years or $590.50 per year for 13 years. The actual mechanisms of a fee collection system and number of eligible accounts are not known at this time.

Table 8: Developed Land BMPs Reproduced from MDE's "Maryland Phase II WIP Strategies: Frederick"

		2010 Progress	2017 Interim Strategy	2025 Final Strategy
BMP Name	Unit			
Bioretention/raingardens	Acres	0	11	10
Bioswale	Acres	0	51	137
Dry Detention Ponds and Hydrodynamic Structures	Acres	3,588	3,644	3,599
Dry Extended Detention Ponds	Acres	4,578	4,317	4,278
Impervious Urban Surface Reduction	Acres	0	525	765
MS4 Permit - Stormwater Retrofit	Acres	3,220	3,259	3,308
Stormwater Management Generic BMP (1985 to 2002)	Acres	13,739	13,156	13,029
Stormwater Management Generic BMP implemented (2002 to 2010)	Acres	2,748	2,878	2,837
Urban Filtering Practices	Acres	335	7,326	13,205
Urban Forest Buffers	Acres	33	719	1,229
Urban Infiltration Practices	Acres	1,434	1,431	1,450
Urban Tree Planting; Urban Tree Canopy	Acres	0	316	675
Vegetated Open Channel - Urban	Acres	0	803	758
Wet Ponds and Wetlands	Acres	5,265	5,226	5,167
Erosion and Sediment Control on Construction	Acres/Year	1,749	1,749	1,749
Erosion and Sediment Control on Extractive	Acres/Year	0	0	262
Forest Conservation	Acres/Year	1,827	2,138	2,146
Urban Nutrient Management	Acres/Year	13,795	35,988	25,197
Street Sweeping Pounds	Lbs/Year	0	721,351	777,626
Urban Stream Restoration / Shoreline Erosion Control	Linear Feet	0	4,535	8,187

Table 9: Matrix of Alternative BMPs from MDE's "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated" Draft, June 2011.

BMP Practice	Efficiency Per Acre			Impervious Acre Equivalent
	TN	TP	TSS	
Mechanical Street Sweeping	4%	4%	10%	0.07
Regenerative/Vacuum Street Sweeping	5%	6%	25%	0.13
Nutrient Management	17%	22%	0%	0.09
Grass/Meadow Buffers	30%	40%	55%	0.27
Forest Buffers	45%	40%	55%	0.34
Impervious Urban to Pervious (MDE)	13%	72%	84%	0.62
Impervious Urban to Forest (MDE)	71%	94%	93%	1.00
Planting Trees on Pervious Urban (MDE)	66%	77%	57%	0.38
Planting Trees on Impervious Urban (MDE)	71%	94%	93%	1.00
Reforestation on Pervious Urban (MDE)	66%	77%	57%	0.38
Reforestation on Impervious Urban (MDE)	71%	94%	93%	1.00
BMP Practice	**Pounds Reduced per Ton of Collected Dry Material**			**Impervious Acre Equivalent**
	TN	**TP**	**TSS**	
Catch Basin Cleaning	1.5	0.6	600	0.40
Storm Drain Vacuuming	1.5	0.6	600	0.40
Mechanical Street Sweeping	1.5	0.6	600	0.40
Regenerative/Vacuum Street Sweeping	1.5	0.6	600	0.40
BMP Practice	**Pounds Reduced per Linear Foot**			**Impervious Acre Equivalent**
	TN	**TP**	**TSS**	
Stream Restoration	0.02	0.035	2.55	0.01
Shoreline Stabilization (MDE)	0.16	0.11	451	0.04*
BMP Practice	**Pounds Reduced per Unit**			**Impervious Acre Equivalent**
	TN	**TP**	**TSS**	
Septic Pumping	0.6	0	0	0.03
Septic Denitrification	6.0	0	0	0.26
Septic Connections to WWTP (MDE)	9.0	0	0	0.39

Table 10: Costs of MDE's "Maryland Phase II WIP Strategies: Frederick" for Stormwater Using Unit Costs from King and Hagan

	DATA						COST		
BMP Name	2010 Progress (Imperv Ac)	2017 Interim Strategy (Imperv Ac.)	2010-2017 Incremental Increase (Imperv Ac.)	2025 Final Strategy (Imperv Ac.)	2017-2025 Incremental Increase (Imperv Ac.)	BMP Unit Cost for 20-yr Life Cycle	2010-2017 Strategy Incremental (20 year NPV)	2017-2025 Strategy Incremental (20 year NPV)	2010-2025 Strategy Cumulative (20 Year NPV)
Bioretention/raingardens*	0	11	11	10	0	$217,370.00	$2,391,070	$0	$2,391,070
Bioswale	0	51	51	137	86	$62,620.00	$3,193,620	$5,385,320	$8,578,940
Dry Detention Ponds and Hydrodynamic Structures**	3588	3644	56	3599	0	$112,620.00	$6,306,720	$0	$6,306,720
Dry Extended Detention Ponds***	4578	4317	0	4278	0	$97,120.00	$0	$0	$0
Impervious Urban Surface Reduction	0	325.5	325.5	474.3	148.8	$163,957.00	$53,368,004	$24,396,802	$77,764,805
MS4 Permit - Stormwater Retrofit****	3220	3259	39	3308	49	$97,120.00	$3,787,680	$4,758,880	$8,546,560
Urban Filtering Practices	335	7326	6991	13205	5879	$88,620.00	$619,542,420	$520,996,980	$1,140,539,400
Urban Forest Buffers	11.22	244.46	233.24	417.86	173.4	$57,207.00	$13,342,961	$9,919,694	$23,262,654
Urban Infiltration Practices	1434	1431	0	1450	19	$84,370.00	$0	$1,603,030	$1,603,030
Urban Tree Planting: Urban Tree Canopy	0	120.08	120.08	256.5	136.42	$207,207.00	$24,881,417	$28,267,179	$53,148,596
Vegetated Open Channel - Urban	0	803	803	758	0	$38,207.00	$30,680,221	$0	$30,680,221
Wet Ponds and Wetlands	5265	5226	0	5167	0	$4,063.00	$0	$0	$0
Erosion and Sediment Control on Construction	1749	1749	0	1749	0	$26,207.00	$0	$0	$0
Erosion and Sediment Control on Extractive	0	0	0	0	0	$26,207.00	$0	$0	$0
Urban Nutrient Management*****	1241.55	3238.92	1997.37	2267.73	0	$3081/yr	$26,776,509	$114,767,280	$141,543,790
Street Sweeping Pounds******	0	144.3	144.3	155.5	11.2	$15,079.00	$2,175,900	$168,885	$2,344,785
Urban Stream Restoration/Shoreline Erosion Control*******	0	45.35	45.35	81.87	36.52	$82,320.00	$3,733,212	$3,006,326	$6,739,538
Totals							**$790,179,732**	**$713,270,376**	**$1,503,450,109**

All Acres of implementation from MDE WIP converted to impervious acres using Maryland's "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated" document. All costs from King and Hagan's "Use of Planning Level Unit Stormwater BMP Costs with MAST Output to compare WIP Alternatives: Planning Level Unit Cost Development for Stormwater Management Best Management Practices (BMPs) Part 4: Integrating Unit Stormwater BMP Costs with MAST Output

*Bioretention (Retrofit - Highly Urban) cost data used from King and Hagan's Report.

**Dry Detention Ponds (New) and Hydrodynamic Structures (New) are listed separately with different costs in King and Hagan's Report. Used Hydrodynamic Structure Cost data. ***Used Dry Extended Detention Ponds (New) cost data

***Used Dry Extended Detention Ponds (New) cost data

****Used Dry Extended Detention Ponds (Retrofit) cost data

*****Urban Nutrient Management acres were converted to impervious acres at 9% per acre treated. Costs were calculated by year. King/Hagan estimate $3081 per acre per year. From 2010-2017: 1241.55ac*$3081/ac-yr*7years. From 2017-2025: 3238.92ac*$3081/ac-yr*8years. From 2025-2030 (to get 20 year costs): 2267.73ac*$3081/ac-yr*5years. 2025-2030 is included in the 2025 numbers to keep all numbers at a 20 year estimate.

******The WIP strategy proposed by MDE for Frederick reports Street Sweeping required treatment in Pounds per Year (721351 for 2017 and 777626 for 2025). This was converted to acres by using the conversion factor provided in "Accounting for Stormwater" document (0.40ac per ton)

*******The WIP strategy proposed by MDE for Frederick reports Stream Restoration treatment in Linear Feet (4535 for 2017 and 8187 for 2025). This was converted to acres by using the conversion factor provided in "Accounting for Stormwater" document (1 impervious ac per 100 ft).

Note: Forest Conservation was included in Phase II WIP; however, efficiencies are negligible so cost data was not included in these costs. Efficiencies from E&S are also not included because no allocations exist for new development.

Appendix A: Current Capacity Analysis

The section below details analyses performed by County staff to examine MDE's underlying assumptions with the TMDL and provide MDE an evaluation of current capacity. The County's concern with this exercise is that it highlights that the more accurate data available from the County was not used by MDE to establish the County's allocations, for good or ill, and that there appears to be no mechanism to correct this. This concern is shared by many sectors. There should be a way to correct MDE and EPA's accounting before 2017 to accurately reflect current conditions and establish more accurate allocations.

Stormwater Restoration Programs

1. Program Description: Please indicate whether your jurisdiction has a program that performs retrofits, which may include other activities that help to remove nutrients such as tree plantings, stream restorations, street sweeping, etc. If so, you are welcome to describe the program.

Frederick County Government is a regulated MS4 Phase I under the NPDES program and is already subject to retrofits. Frederick County met a requirement in its last permit cycle which began March 11, 2002 to address treatment of 10% of the County's untreated urban impervious area. In that permit cycle, it was estimated this came to 672 acres based on MDE's definition of the MS4 boundary at that time. See Table 11 for a description of individual projects completed by 2010. The 2002 permit has been administratively extended since 2007, so significantly more acres were accomplished. The County also tracks progress on nonregulated stormwater projects as part of a Nonpoint Source EPA 319 grant. The County has relied heavily on the use of nonstructural practices that provide water quality and serve secondary benefits to protect habitat and green infrastructure. The County has created an urban wetlands program to enhance degraded wetlands and convert stormwater ponds into wetland areas at a low cost per acre. The County has also created an urban forestry program to increase tree canopy on both public and private lands.

The impervious area accounting in the table below reflects accounting methods consistent with previous years of tracking and with the Chesapeake Bay Program's accounting of nutrient reductions. The "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated" document published in draft by MDE in June 2011 removes approximately 90% of impervious area previously credited; this is not reflected in the numbers in the table below this section. The County is concerned with the policy implications of this document, as it believes that the document is being enacted as regulation in violation of the Administrative Procedures Act and will prevent implementation of cost-effective practices.

2. Budget: Recent budget levels provide a general measure of the potential capacity of a program. We understand that the past is not always a good predictor of the future and that new information must be considered. If you have a program that performs stormwater retrofits, please provide recent capital and operating budget.

- Operating budget costs for a 5-year permit at current funding levels are $2,531,375. This includes $949,030 for personnel. The costs to comply with the permit intersect the TMDL costs, but are separate.

- Costs from the CIP for a 5-year permit to conduct retrofits were approximately $1.5MM. Note that no new CIP projects are proposed at this time because we have completed the previous permit's CIP and are waiting for a new permit to dictate the CIP requirements.

Furthermore, as discussed above, the accounting for the current strategy used by the County's NPDES program will be reduced by 90% due to the new impervious area accounting methods. A new strategy will have to be developed to get full credit under the NPDES permit and meet the required 20% reduction within it. The greatest number of acres from any practice under the previous permit was from street sweeping, which was not counted as a cost in the above analysis because it was part of Highway Operations; however, we may only get 7% of an acre in the future for every acre swept and are no longer looking at this as a cost-effective strategy for the bulk of the acres required.

3. Staffing: Recent staffing levels provide a general measure of the potential capacity of a program to perform stormwater retrofits. Please provide an estimate of your fulltime equivalent (FTE) staff accounting for the use of contractors as you deem appropriate.

The NPDES compliance program has 2 full time staff in the Watershed Management Section. There is 1 GIS person who manages NPDES data requirements and 0.5 FTE from the Office of Project Management in DPW who manages CIP projects for NPDES. Staff in other divisions works on NPDES requirements as less than 50% of their jobs.

4. Current Pace of Implementation: If you jurisdiction performs stormwater retrofits, please provide an estimate of the acres treated on an average annual basis.

Using MDE's new accounting standards, Frederick County completes approximately 9.9 acres of restoration per year. That is, 989.7 acres treated for NPDES compliance with a 90% reduction in efficiency divided over the 10 years between 2002 and 2012, which is when the projects in the spreadsheet below are estimated to be completed.

5. Options for Building Capacity: Maryland's Phase I WIP includes a provision for enacting a mandatory Stormwater Utility Fee System if the State falls short in meeting stormwater restoration requirements or equivalent pollutant load reductions. Do you plan on implementing a Stormwater Utility Fee System to cover the increasing cost of implementing stormwater restoration? Please provide the status of any pending programs or legislation.

The County is regulated under HB987 which requires all MS4 Phase I jurisdictions in Maryland to develop a Stormwater Utility Fee.

Table 11: Current, Planned, and Completed Watershed Restoration Projects within Frederick County as of December 31, 2010

Project Number	Project Location	Project Type	Watershed	Project Status	Year of Completion	Reduction			
						Nitrogen (lbs/yr)	Phosphorus (lbs/yr)	Sediment/Total Suspended Solids (TSS) (lbs/yr)	Treated Impervious Area (acres)
Frederick County NPDES Capital Improvement Projects (CIPs)									
CIP-3	Ballenger Creek Elementary School	Stream Restoration	Ballenger Creek	Complete	2007	12.10	2.12	1,542.75	4.00
		Urban Forest Buffer				12.85	0.85	343.56	
CIP-4	Urbana High School	Stormwater Retrofit (LID)	Upper Bush Creek/Bennett Creek	Complete	2007	5.42	0.81	231.58	2.83
		SWM Wetland			2009	35.03	5.63	0.00	18.30
		Tree Planting			2009	12.85	1.58	284.66	3.00
CIP-45	Pinecliff Park	Stream Restoration	Lower Linganore Creek	In Progress	2010	18.60	3.26	2,371.50	46.40
		Urban Forest Buffer							
CIP-46	Public Safety Training Facility	SWM Nonstructural	Lower Linganore Creek	In Progress	2010	28.71	4.32	1,227.48	15.00
CIP-190	Urbana Highway Ops Satellite Yard	SWM Infiltration	Bennett Creek	In Progress	2010	13.39	2.32	944.34	5.77

Project Number	Project Location	Project Type	Watershed	Project Status	Year of Completion	Reduction			
						Nitrogen	Phosphorus	Sediment/Total Suspended Solids (TSS)	Treated Impervious Area
						(lbs/yr)	(lbs/yr)	(lbs/yr)	(acres)
CIP-206	Brunswick Library	Surface Sand Filter	Catoctin Creek	In Progress		3.87	0.67	273.32	1.67
CIP-209	Citizens Care & Rehabilitation Center/Montevue Home	SWM Wet Pond	Carroll Creek	In Progress		29.19	7.58	3,088.34	25.16
					SUBTOTAL	**172.00**	**29.13**	**10,307.54**	**122.13**
Frederick County Community Restoration Projects									
CCRP-5	Libertytown Elementary School	Rain Garden	Upper Linganore Creek	Complete	2006	0.48	0.07	20.46	0.25
CCRP-6	Liberty Village Cohousing Community	Rain Garden	Lower Linganore Creek	Complete	2006	0.37	0.13	30.00	0.25
		Urban Forest Buffer				41.98	1.89	769.57	8.40
		Urban Grass Buffer				31.32	2.02	824.54	9.00
CCRP-7	St. Peter the Apostle Roman Catholic Church	Urban Forest Buffer	Lower Linganore Creek	Complete	2006	7.50	0.34	137.42	1.50
		Urban Grass Buffer				0.63	0.04	16.49	0.18

Project Number	Project Location	Project Type	Watershed	Project Status	Year of Completion	Reduction			
						Nitrogen (lbs/yr)	Phosphorus (lbs/yr)	Sediment/Total Suspended Solids (TSS) (lbs/yr)	Treated Impervious Area (acres)
CCRP-8	Backyard Buffer	Urban Forest Buffer	Countywide	Ongoing		242.88	10.92	4,452.54	48.60
CCRP-11	Windsor Knolls Middle School	Rain Garden	Bennett Creek	Complete	2005-2010	0.48	0.07	20.46	0.25
		SWM Wetland		Complete		26.03	4.19	0.00	13.60
		Tree Planting		In Progress		115.66	14.18	2,561.98	27.00
		Urban Riparian Forest Buffer		Complete		44.98	2.02	824.54	9.00
CCRP-13	Kemptown Elementary School	Rain Garden	Bennett Creek	Complete	2005-2008	0.48	0.07	20.46	0.25
		Urban Forest Buffer				6.75	0.30	123.68	1.35
CCRP-18	Septic Upgrades	Septic Denitrification (MDR)	Countywide	Complete		27.49	0.00	0.00	35.00
CCRP-55	Libertytown Park	Rain Garden	Upper Linganore Creek	Complete	2006	2.10	0.32	89.85	1.10
		Tree Planting				1.41	0.17	31.31	0.33
		Urban Forest Buffer				96.44	4.34	1,768.06	19.30
		Urban Grass Buffer				28.19	1.82	742.09	8.10

Project Number	Project Location	Project Type	Watershed	Project Status	Year of Completion	Reduction			
						Nitrogen	Phosphorus	Sediment/Total Suspended Solids (TSS)	Treated Impervious Area
						(lbs/yr)	(lbs/yr)	(lbs/yr)	(acres)
CCRP-57	Fountainrock Park	Wetland	Glade Creek	Complete	2009	1.16	0.30	122.75	1.00
CCRP-62	Monocacy Elementary School	Urban Grass Buffer	Tuscarora Creek	Complete	2007	0.87	0.06	22.90	0.25
CCRP-64	Thurmont Middle School	Urban Forest Buffer	Hunting Creek	Complete	2004	0.30	0.01	5.50	0.06
CCRP-69	Utica Park	Urban Forest Buffer	Fishing Creek	Complete	2007	44.98	2.02	824.54	9.00
CCRP-71	Mt. Airy Village Gate Park	Urban Forest Buffer	Upper Linganore Creek	Complete	2007	40.63	1.83	744.84	8.13
CCRP-72	Mt. Airy East West Park	Urban Forest Buffer	Upper Linganore Creek	Complete	2007	50.55	5.27	1,073.87	11.40
CCRP-80	Deer Crossing Elementary School	Rain Garden	Lower Linganore Creek	Complete	2007	0.76	0.11	32.41	0.40

Project Number	Project Location	Project Type	Watershed	Project Status	Year of Completion	Reduction			
						Nitrogen	Phosphorus	Sediment/Total Suspended Solids (TSS)	Treated Impervious Area
						(lbs/yr)	(lbs/yr)	(lbs/yr)	(acres)
CCRP-131	Cooperative Extension Building	Tree Planting	Carroll Creek	Complete		2.14	0.26	47.44	0.50
CCRP-137	Governor Thomas Johnson High School	Rain Garden	Carroll Creek	Complete	2005	0.24	0.21	23.48	0.50
CCRP-138	Governor Thomas Johnson Middle School	Rain Garden	Carroll Creek	Complete	2005	0.48	0.07	20.46	0.25
		Urban Forest Buffer				1.50	0.07	27.48	0.30
CCRP-139	West Frederick Middle School	Urban Forest Buffer	Carroll Creek	Complete	2005	17.99	0.81	329.82	3.60
CCRP-140	Thurmont Elementary School	Rain Garden	Hunting Creek	Complete	2005	0.48	0.07	20.46	0.25
CCRP-142	Holly Hills HOA	Urban Forest Buffer	Lower Linganore Creek	Complete	2007	44.98	2.02	824.54	9.00
CCRP-143	Holly Hills Country Club	Urban Forest Buffer	Lower Linganore Creek	Complete	2007	52.47	2.36	961.97	10.50

Project Number	Project Location	Project Type	Watershed	Project Status	Year of Completion	Reduction			
						Nitrogen	Phosphorus	Sediment/Total Suspended Solids (TSS)	Treated Impervious Area
						(lbs/yr)	(lbs/yr)	(lbs/yr)	(acres)
CCRP-144	Pinecliff Park	Urban Forest Buffer	Lower Linganore Creek	Complete	2007	0.72	0.03	13.19	0.14
CCRP-145	Mt. Saint Mary's Run	Urban Forest Buffer	Toms Creek	Complete	2007	2.70	0.12	49.47	0.54
CCRP-146	Mt. Airy Windy Ridge Park	Urban Forest Buffer	Lower Linganore Creek	Complete	2008	179.91	8.09	3,298.18	36.00
		Urban Grass Buffer				61.71	3.98	1,624.35	17.73
CCRP-148	Tuscarora Elementary School	Tree Planting	Ballenger Creek	Complete	2007	1.10	0.05	20.16	0.22
CCRP-150	Myersville Elementary School	Tree Planting	Catoctin Creek	Complete	2007	0.04	0.01	0.95	0.01
CCRP-152	Wolfsville Elementary School	Tree Planting	Catoctin Creek	Complete	2008	0.77	0.09	17.08	0.18
CCRP-153	Walkersville High and Elementary Schools	Tree Planting	Israel Creek	Complete	2008	1.71	0.21	37.96	0.40

Project Number	Project Location	Project Type	Watershed	Project Status	Year of Completion	Reduction			
						Nitrogen	Phosphorus	Sediment/Total Suspended Solids (TSS)	Treated Impervious Area
						(lbs/yr)	(lbs/yr)	(lbs/yr)	(acres)
CCRP-155	Up County Family Support Center	Rain Garden	Toms Creek	Complete	2008	0.005	0.004	0.47	0.01
CCRP-157	Emmitsburg Elementary School	Rain Garden	Toms Creek	Complete	2009	0.07	0.06	7.04	0.15
		Urban Grass Buffer		Complete		4.65	0.21	85.20	0.93
CCRP-159	Urbana Middle School	Tree Planting	Bennett Creek	Complete	2009	1.07	0.13	23.72	0.25
CCRP-161	Valley Elementary School	Tree Planting	Catoctin Creek	Complete	2009	18.29	2.24	405.17	4.27
		Wetland			2008	0.62	0.16	65.92	0.54
CCRP-191	Kemptown Park	SWM Bioretention	Bennett Creek	Complete	2009	0.61	0.13	47.26	0.42
CCRP-192	Street Sweeping Highway Ops - Streets and Bridges 2009	Street Sweeping Vacuum Annual	Countywide	Ongoing		0.00	0.00	0.00	430.31
CCRP-195	Urbana Community Park	Riparian Forest Buffers (previously cropped, LU conversion)	Bennett Creek	Complete	2009	17.01	1.87	572.65	2.20

Project Number	Project Location	Project Type	Watershed	Project Status	Year of Completion	Reduction			
						Nitrogen	Phosphorus	Sediment/Total Suspended Solids (TSS)	Treated Impervious Area
						(lbs/yr)	(lbs/yr)	(lbs/yr)	(acres)
CCRP-198	Bar T Mountainside	Rain Garden	Bennett Creek	In Progress	2009-2010	0.96	0.14	40.92	0.50
		SWM Wetland		In Progress	2010	5.80	1.51	613.74	5.00
		Urban Riparian Forest Buffer		Complete	2009	82.24	5.55	2,261.61	28.80
CCRP-199	Worthington Manor Golf Course	SWM Wetland	Bennett Creek	In Progress	2010	21.58	5.60	2,283.11	18.60
		Urban Riparian Forest Buffer		In Progress	2010	71.96	3.24	1,319.27	14.40
CCRP-200	Middletown High School	Tree Planting	Catoctin Creek	Complete	2009	1.07	0.13	23.72	0.25
CCRP-201	Oakdale Elementary School	Tree Planting	Lower Linganore Creek	Complete	2009	0.04	0.01	0.95	0.01
CCRP-210	Urbana Elementary School	Bioretention/Bioswale	Bennett Creek	In Progress	2010	8.70	1.81	675.11	6.00
					SUBTOTAL	**1,418.00**	**93.75**	**31,003.11**	**806.45**

Project Number	Project Location	Project Type	Watershed	Project Status	Year of Completion	Reduction			
						Nitrogen (lbs/yr)	Phosphorus (lbs/yr)	Sediment/Total Suspended Solids (TSS) (lbs/yr)	Treated Impervious Area (acres)
Monocacy & Catoctin Watershed Alliance (MCWA) Partnership Projects									
MCWA-14	Fred Archibald Sanctuary	Urban Forest Buffer	Lower Linganore Creek	Complete	2007	59.97	2.70	1,099.39	12.00
MCWA-17	Catoctin Mountain Park	Porous Pavement	Hunting Creek	Complete	2006	0.58	0.07	56.26	0.50
MCWA-26	Waterford Park	Urban Forest Buffer	Carroll Creek	Ongoing		92.45	4.16	1,694.90	18.50
MCWA-28	New Forest Society Grow Out Nursery	Urban Forest Buffer	Toms Creek	Complete	2007	3.86	0.47	85.40	0.90
MCWA-41	Little Catoctin Creek	Stream Restoration	Little Catoctin Creek	Complete	2007	105.60	18.48	13,464.00	20.00
MCWA-43	Thorpewood	SWM Nonstructural	Hunting Creek	Complete	2007	0.48	0.07	20.46	0.25
MCWA-48	Brook Hill United Methodist Church	Rain Garden	Tuscarora Creek	Complete	2007	0.24	0.21	23.48	0.50
MCWA-66	Carroll Creek	Stream Restoration	Carroll Creek	Complete	2007	4.00	0.70	510.00	0.23

Project Number	Project Location	Project Type	Watershed	Project Status	Year of Completion	Reduction			
						Nitrogen	Phosphorus	Sediment/Total Suspended Solids (TSS)	Treated Impervious Area
						(lbs/yr)	(lbs/yr)	(lbs/yr)	(acres)
MCWA-77	State Highway Administration Stream Restoration - TEP	Stream Restoration	Potomac Direct	Complete	2009	26.00	4.55	3,315.00	1.94
MCWA-79	Cloverhill	Urban Forest Buffer	Tuscarora Creek	Complete	2006	31.48	1.42	577.18	6.30
					SUBTOTAL	**324.66**	**32.82**	**20,846.07**	**61.12**
					TOTAL	**1,914.66**	**155.70**	**62,156.71**	**989.7**

Septic System Upgrades

The County provides responses to the following questions from MDE:

1. Program Description: Please provide brief description of how septic system upgrades to nutrient removal best available technology (BAT) is managed in your jurisdiction. A short paragraph is sufficient.

The Frederick County Health Department (FCHD) Bay Restoration Fund (BRF) program is directly linked to the amount of funding received from MDE through a partnership/privatization approach with Canaan Valley Institute (CVI), a non-profit organization. MDE provides grant funding directly to CVI who manages and administers the grant, handles procurement, payments, etc. while FCHD, through MOU with CVI, designs, permits, and inspects BRF systems being installed under the grant.

1st round of funding (FY2007) = $800,000 - 35 systems installed including some large non-residential (commercial) systems

2nd round of funding (FY2011) = $114,000 - installations underway

3rd round of funding (FY2011) = ~$114,000 (pending award)

2. Budget/Revenues: MDE is aware of each county's funding level from the Bay Restoration Fund (BRF). If your jurisdiction has additional revenues to support BAT upgrades of septic systems, please provide the funding levels. If you have annual operating costs for managing this program, please provide an estimate.

$13,500 for FCHD Staff working on BRF upgrades.

If you have a sense of the local share of expenditure projections for 2012 and 2013, this information would be helpful in anticipation of developing 2-Year Milestones.

$13,500 for FCHD Staff working on BRF upgrades per year.

3. Staffing: If you have a septic upgrade program, please provide an estimate of the level of full-time equivalent (FTE) staffing. If contractor services are used that are funded locally, please briefly describe them and their role.

2.0 FTE (1.75 CVI staff plus 0.25 FCHD staff.)

4. Current Pace of Implementation: MDE is aware of each county's level of septic upgrades funded by the Bay Restoration Fund (BRF). If possible, please provide numbers of upgrades that are not BRF funded, i.e. that are funded locally or privately.

Approximately 15 systems per year funded through BRF, 0 systems with other funding.

5. Options for Building Capacity: Please describe any local plans for expanding capacity to upgrade systems to BAT.

The County has significantly more demand for septic upgrades than it has funding available; however, the state's policy since after the first year has been to target 90% of funding to Critical Area Counties. The County could do $500,000 in upgrades every year at $12K per system if the State were to make funding available.

Waste Water Treatment

The County provides responses to the following questions from MDE:

1. Do you foresee a need to upgrade any minor treatment plants before 2017? 2020?

Yes

2. If yes to above, please identify the plant(s).

White Rock WWTP (MD0025089, 07-DP-0278)

3. If yes, explain why you foresee a need to upgrade the plant(s).

White Rock WWTP – Current facility has reached the end of its service life and requires replacement.

4. If yes, do you have a funding strategy for upgrade the plant(s)?

A Capital Improvement Project (CIP) fund has been established to replace the current White Rock WWTP with a package wastewater treatment plant.

5. Do you foresee a need to expand any minor treatment plants before 2017? 2020?

No

Significant errors were found with MDE's reporting. Staff corrected these errors to help MDE estimate actual capacity.

For the Ballenger-McKinney plant, Frederick County Division of Utilities and Solid Waste Management (DUSWM) databases showed some discrepancies for some of the 2009 values.

The Fountaindale WWTP Plant was upgraded/replaced with Sequencing Batch Reactor (SBR) technology March 2008. Water quality characteristics shown in MDE's data are prior to completion of this upgrade. There are significant differences with current effluent water quality. The Libertytown WWTP was tied into the Ballenger McKinney System in June 2008 and taken out of service, although a valid NPDES discharge permit still exists. The Kemptown School WWTP has been operated as a holding tank and hauled to Ballenger-McKinney since Sept 2005, so it is unclear why an average flow of 0.005 MGD has been indicated. The Crestview Estates WWTP does not have capacity to accommodate growth and should not see additional projected flow in 2017. It appears that a standard formula was applied to all systems to project future flow without taking into consideration whether a system had been closed to future development.

Regarding "2008/2007 TN Average Concentration (mg/l)," DUSWM has questions regarding accuracy of 2007/08 data for TP and TN. MDE has clarified that in the absence of actual data, default values of 18 mg/l TN and 3 mg/l TP were used. If default values were not used, actual data taken from Discharge Monitoring Reports (DMRs) were used. However, numerous systems did not have a requirement to include this information on DMRs, but somehow have values assigned to them. In the 2007/08 timeframe, only Jefferson, Monrovia, and New Market submitted TN and TP information in their respective DMR.

Regarding "DUSWM 2008/2007 TN Average Concentration (mg/l)," staff noted that DUSWM has been monitoring TP and TN data from all of our wastewater treatment plants for our internal use. On the spreadsheet, they included data from

the 2007/08, and 2010 calendar years for comparison. You will note significant differences in the 2007/08 TN and TP data from MDE and DUSWM. DUSWM data is indicated in red.

Other Local Programs

Other Local Programs are described in Table 12 on the following page.

Table 12: Capacity Analysis of Other Local Area Programs

Program	Program Organization and Description	Budget	Staffing	Estimated Pace of Implementation	Options for Building Capacity	Other
Watershed Management Planning	Programs or projects to develop small watershed plans that help to identify and prioritize restoration actions as well as inform decision on future growth within that watershed	Part of NPDES Compliance	Part of NPDES Compliance	Part of NPDES Compliance	Part of NPDES Compliance	Part of NPDES Compliance
Land Use Planning	The County's 2010 Comprehensive Plan is the guiding policy (and map) document for land use and development decisions in FC. Community Growth Areas have been adopted that indicate where residential and employment growth and development will be targeted and where a higher level of public infrastructure investment is expected, e.g., public water/sewer service, roads, school construction. Sensitive environmental resources (slopes, stream valley corridors, floodplains, contiguous forestlands, etc) are designated "Natural Resource" with corresponding Resource Conservation zoning to limit conversion of natural areas to other uses.	FY 2010 adopted budget for Planning and Zoning Department: $2,090,829	FY 2010: 20 FTE	Countywide Comprehensive Plan updated every 6—8 years, per state law. Community/Corridor Plans area developed when needed (after Municipal Master Plans updates) or directed by Board of County Commissioners (BOCC). Comprehensive Countywide rezoning occurs after Comp. Plan or Municipal Plan update or when directed by BOCC.		

Land Conservation	FC's land preservation program works to protect land for future local food and fiber production. The County utilizes local, State, Federal funding to permanently preserve productive agricultural land, areas rich in natural, cultural or forestry resources, or environmentally sensitive areas.	FY 2012 proposed budget: $6.9 M	1 FTE	2007 acres preserved: 3,177*; 2008 acres preserved: 2,387*; 2009 acres preserved: 2,811*; 2010 acres preserved: 1,572*	-Increase funding from State of Maryland; additional county staff; increase share of recordation tax and Ag. transfer tax; expand tax credits for preserved properties; evaluate Transfer of Development Rights program	Includes the following programs: MALPF, Rural Legacy, CREP and MET easements, ISTEA easements, County Installment Purchase Program (IPP)
Forest Conservation Programs	FC's Forest Resource Ordinance (FRO) was adopted in 1992 to comply with MD's Forest Conservation Act of 1991 and addresses reforestation and conservation of existing forest associated with land development. The FRO also has a 'banking' program and Fee-in-Lieu (of planting) component.		1 FTE	Acres preserved or planted under the FRO guided by the amount of development activity in a given year.		In 2010, the County initiated the expenditure of 75% of the fee-in-lieu account balance to acquire permanent protective easements on newly-planted forest on private lands in the Linganore Watershed.
Critical Area Program	How this program is implemented to protect riparian buffers and wetlands along shorelines	N/A	N/A	N/A	N/A	N/A

Wetlands	Programs that either complement or augment state and federal programs to protect wetlands.	Part of NPDES Compliance	Part of NPDES Compliance	Part of NPDES Compliance	Part of NPDES Compliance	Part of NPDES Compliance
Vegetated Buffers	Programs that protect and restore buffers to streams, lakes, shorelines and or wetlands	Part of NPDES Compliance	Part of NPDES Compliance	Part of NPDES Compliance	Part of NPDES Compliance	Part of NPDES Compliance
Stream Restoration	Programs that focus on the restoration of streams, including watershed restoration tied to improving stream health.	Part of NPDES Compliance	Part of NPDES Compliance	Part of NPDES Compliance	Part of NPDES Compliance	Part of NPDES Compliance

Appendix B: Draft Phase II WIP Strategies

Team's Draft Phase II WIP Development Process

Staff from Frederick County Government, Municipalities, the local Builder's Association, consulting firms, Metropolitan Washington Council of Governments (MWCOG), representatives from the Frederick and Catoctin Soil Conservation Districts, Federal and State agency partners, and others met on a monthly basis from March to November 2011 with Chris Aadland of the MDDNR, who was the local WIP representative with the State. Meetings with Chris centered on dissemination of information from MDE, which was voluminous and constantly changing in substance. The meetings typically took place the third Monday of each month at the Frederick County Division of Public Works building from 10-12.

On May 26, 2011, the Acting Manager of Frederick County's Office of Sustainability and Environmental Resources and the City Engineer for the City of Frederick presented to the County/Municipalities meeting on the subject of the Chesapeake Bay TMDL and Watershed Implementation Plan. Dr. Rich Eskin from the Maryland Department of the Environment was also in attendance, and provided public comment.

At the August 2011 County/Municipalities meeting, the Acting Manager of Frederick County's Office of Sustainability and Environmental Resources discussed the option to develop a scenario to meet the Frederick County requirements of the State WIP;

- County/Municipal leaders wanted to determine level of implementation and costs required to meet the WIP based on their own analysis;
- Guidance was to propose a scenario for leaders to accept/reject for submission to MDE;
- Stormwater scenarios were developed on September 7, 2011 with participation from Municipalities (Brunswick and Frederick), Frederick County staff on internal TMDL Advisory Committee, Builder's Association reps, Fort Detrick representative, Center for Watershed Protection representative, and MWCOG representative.

Staff had to use the draft numbers from MDE because the EPA numbers, though due on August 15th from MDE to municipalities, had not yet been released, and the deadline for Local Area Plans was to be November 18, 2011.

The analysis was presented to the County/Municipalities meeting for information but not for submittal due to the use of draft numbers.

When the final EPA numbers were released on September 14, they were significantly changed from the previous MDE estimates. When the MAST tool was updated in about the same timeframe, the numbers did not match those in the September 14 publication from MDE. Per an email from Jim George at MDE dated October 18, 2011, we were to use the updated numbers in MAST and apply the reduction in the publication. We have continued to use the reduction numbers calculated from this publication as the reduction goals for the WIP in lieu of new guidance.

In a letter dated 10/5/2011 EPA Region III Administrator Shawn Garvin laid out a "Path Forward" that revised the Phase II WIP guidance. EPA's revised guidance is in response to concerns that have been raised about the time constraints and limitations of the Bay watershed model.

EPA no longer expects jurisdictions' WIPs to express local targets in terms of pounds of pollutant reductions by county, rather, Phase II WIPs may identify local actions that would be taken "to fulfill their contribution toward meeting…TMDL allocations." These actions can be expressed as "programmatic actions" such as adopting ordinances.

MDE put out guidance on 10/25/2011, (paraphrased):

MDE will present and establish allocations, progress runs and strategies (BMP reduction analyses) at the major basin scale. The basin-scale strategies will reflect, as much as possible, strategies received from the local teams. It will provide a narrative describing in general terms what was included and what is expected in the future. It will also note the opportunities for continued local team input during the public comment period on the WIP, as well as subsequent revisions to the WIP in response to comments on the Bay TMDL.

State will include a set of generic urban stormwater BMPs in the Phase II WIP that meet the municipal load reductions, which can be changed by municipalities in the future following the completion of the WIP. Final WIP guidance, entitled "WIP II Local Team Strategy Guidance," provides further instructions for municipal Phase II MS4 jurisdictions (p. 3).

Staff with OSER met with the head of Environmental Health to develop a strategy for Septics on October 19, 2011. Staff within OSER met with Planning staff to build new stormwater scenarios in MAST October 20, 2011. An email from Nan Lyon of MDE dated November 1, 2011, stated that the numbers had once again been updated in the MAST tool. As the draft Local Area Plan was due November 18, 2011, it was unreasonable to expect local governments to re-run the scenarios in that time and rewrite the Local Area Plans.

Notably, the projections for the Municipalities were not possible to create with participation from Municipalities in the short timeframe provided by MDE. The numbers for Municipalities were provided in aggregate, and individual Municipalities could not see their required reductions. MDE provided a tool for municipalities to use on October 25, 2011. This tool breaks out loads by Municipality. Staff from OSER reviewed the tool with Municipal leaders on November 9 and at the Frederick Watershed Implementation Plan meeting with DNR on November 14, 2011.

In a letter dated October 5, 2011, EPA Region III Administrator Shawn Garvin laid out a "Path Forward" that revised the Phase II WIP guidance. EPA's revised its guidance in response to concerns raised about the time constraints and limitations of the Bay watershed model. Per an email from Jim George of MDE on October 25, "EPA no longer expects jurisdictions' WIPs to express local targets in terms of pounds of pollutant reductions by county."

On November 18, 2011, the Manager of the Office of Sustainability and Environmental Resources submitted a response to MDE's request for a Draft Watershed Implementation Plan. This submittal included an analysis of existing capacity, BMP implementation, and technical issues for Frederick County Government. It did not include MAST scenarios or two-year milestones.

Frederick County's Draft Phase II WIP Submission

The County used the Maryland Assessment Scenario Tool (MAST) to develop strategies to meet the September 2011 revised 2017 and 2020 goals for the MS4 Phase I Stormwater sector and for the Septic Sector. Scenarios were developed on October 19 and 20 for Septics and MS4 Phase I stormwater. These MAST scenarios did not reflect the most recent changes to the MAST too dated November 1, 2011, as there was not enough time available to build new scenarios. Frederick County did not submit MAST scenarios with this report.

Stormwater Restoration Programs

Frederick County modeled stormwater retrofit scenarios on October 20,

2011. The BMP used was the MDE stormwater retrofit BMP in the MAST tool.

MDE's MAST tool says that the County MS4 Phase I (Just the county, not its municipalities or urban areas owned by other entities like the State or Federal Government) contains 7,269.9 acres of impervious and 31,226.7 ac of pervious urban land. Note that there is some discrepancy with the definition of the MS4 boundary. According to MDE Stormwater Program's accounting methods for our last NPDES MS4 permit cycle beginning March 11, 2002, Frederick County's MS4 boundary was the entire urban area within the County that was not part of a Phase II MS4. Thus, there was no unregulated urban area. MDE's MAST tool appears to be based on census-designated urban areas with a correction factor from MDP data as defined by MDE's Science Services Administration, and does have unregulated urban area. Neither of these methods is consistent with the actual definition of the MS4 boundary in Title 40 of the Clean Water Act (see text box). Frederick County is conducting a GIS exercise to evaluate these different boundary definitions and their effect on MS4 Permit compliance as well as TMDL efforts.

Frederick County is in the middle of an MS4 permit renewal and is working to determine the obligations under this permit. MDE has recently issued "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated DRAFT" document in June 2011; this document has not been finalized, and it will have a major impact on the level of implementation required as well as the specific BMP types to be used. A number of BMPs in this document are under consideration but do not yet have pollutant removal efficiencies approved by MDE or EPA. The Chesapeake Stormwater Network issued its own guidance under "CSN Technical Bulleting No. 9. Nutrient Accounting Methods to Document Local Stormwater Load Reductions in the Chesapeake Bay Watershed REVIEW DRAFT" on August 15, 2011. This document proposes changes to the accounting for the urban stream restoration Best Management Practice which will be under consideration by the Bay Program; this could represent an order of magnitude change or more in pollutant removal efficiencies and will likely have a large effect on the implementation of this practice. It is premature for Frederick County to lay out its BMP strategy without having permit requirements or clear guidance on BMP nutrient removal efficiencies.

The following solutions need to be promoted by MDE and EPA for stormwater so that we can make greater progress towards the urban portion of the TMDL.

1. Prevention of urban fertilizer application at the source should be the State's primary objective for all jurisdictions. Correction of the problem before it gets distributed into waterways is the best way to control nutrients, rather than trying to filter out some proportion with a costly physical practice. As Urban Nutrient Management (for residences that do not hire lawn companies) is a voluntary program which currently has no enrollment, the level of implementation needed to meet the goal is not predicted to be feasible; however, a compulsory program at the state level could be feasible. It would also be free, as opposed to costing hundreds or thousands of dollars per pound of pollutant removed. 78% of individuals fertilize their lawns (Schueler and Swann, 1999). 65% of those people "overfertilize" (more than twice per year based on data from Swann (1999), Morris and Traxler, (1996) and Knox *et al.* (1995))
2. A significant amount of Nitrogen that is allocated to the Urban Sector is actually from atmospheric deposition (see "CSN Technical Bulleting No. 9. Nutrient Accounting Methods to Document Local Stormwater Load Reductions in the Chesapeake Bay Watershed REVIEW DRAFT" for a discussion). Atmospheric deposition of Nitrogen should be addressed at its source through transportation initiatives to reduce byproducts of incomplete combustion from the burning of fossil fuels. The Bay Program and MDE should find a way to develop BMP efficiencies through transportation initiatives. This could include credit for mass transit, reductions in vehicle miles traveled, efficiencies in removing traffic congestion, use of alternative fuels, etc. In particular, Tier III air quality standards in the Clean Air Act need to be modeled and cost estimates need to be developed to determine the efficiency of atmospheric initiatives. The reductions should be applied to all areas that have been given a load in order to decrease the stormwater retrofit burden for jurisdictions.
3. MDE and EPA should develop a way to credit a number of Best Management Practices that are currently missing from their credit schemes. An example is pet waste reduction programs. The Watershed Treatment Model includes metrics to reduce pet waste through outreach. This approach is similar to Urban Nutrient Management and is based

on standardized research, but this BMP is currently not accepted by MDE or the Bay Program. The percent willing to change is highly dependent on the establishment of ordinance and enforcement.

4. MDE and EPA need to finalize the proposed changes to the stream restoration practices that will more accurately reflect the pollutant removal of stream restoration projects; this will have a huge impact on the amount of stream restoration performed.
5. Give full credit to nonstructural practices. Frederick County and its Watershed Alliance partners can plant an acre of trees for a cost of about $6,000, with all expenses included. An acre of forest buffer planted treats two acres, according to the Chesapeake Bay Program, including one acre of land conversion and one acre of treatment efficiency, and costs $3000 per acre treated. This practice should otherwise be an extremely attractive measure to treat sheet flow from urban areas, but proposed accounting practices at MDE relating to "impervious area" make this practice inaccessible. MDE's new accounting measures require 2.9 acres of buffer to be planted to take one acre of credit; this is unfortunate. Without practices like tree planting, forest buffers, and grass buffers, it is unlikely that jurisdictions will be able to afford to meet TMDL requirements.
6. Allow for trading inside and outside of sectors. For example, significant unregulated urban areas exist and may provide more cost-effective opportunities for restoration than areas inside of the MS4. This will also be an issue for septic upgrades, which have a very low number of pounds of nitrogen removed per dollar spent. Furthermore, without trades, there is no ability to conduct offsets, and this is predicted to stop all development requiring stormwater or septics. MDE has spoken about offsets and trading but has not put anything in place.
7. Allow jurisdictions to conduct structural retrofits where they are actually needed based on field assessments; however, Frederick County respectfully suggests that structural retrofits are not a cost-effective solution to meeting the requirements of the Chesapeake Bay TMDL in a wholesale manner.

Septic System Upgrades

According to MDE, Frederick County has 36,011 septic systems. 17,015.9 of these are within 1000 feet of a stream, and 18,995.1 are outside of a stream buffer. No systems exist in the critical area. Currently, 15 systems per year are retrofitted using the Bay Restoration Funds.

On October 19, 2011, staff from OSER and Environmental Health developed scenarios in the MAST tool to meet the 2017 requirements for reductions from existing septic systems. Though the numbers in the MAST tool differed from the numbers in the State's September 14, 2011, publication, a guidance email issued October 18, 2011 by Jim George at MDE has us meet the reductions required in the September 14, 2011 publication:

- 2017 Goal: 24,903 lbs/yr reduction
- 2020 Goal: 35,576 lbs/yr reduction

Planning staff working on Water and Sewerage Amendments advised that the number of connections, which are within areas planned for public sewerage per year, would be very small (the number quoted was two) and that connections to public sewerage systems, would not be a strategy to use for septics. It is particularly important to remember that the infrastructure has been designed and constructed for properties within planned growth areas, which include some septic systems, but cannot assume wastewater treatment facilities as a unilateral strategy. Using a pumping strategy, 100% of all systems would have to be pumped to remove a small portion of the goal. It was determined that the only effective strategy for existing septic systems would be denitrification, though it would be costly. We would need financial assistance to increase the current implementation rates by potentially three orders of magnitude.

Waste Water Treatment

Since the *1987 Monocacy River Wastewater Treatment Alternatives Study* was completed, the County has voluntarily pursued the diversion of flow from several minor treatment facilities (those facilities with a design capacity less than 0.5 MGD), to the Ballenger-McKinney WWTP where BNR level of treatment could be achieved. These Frederick County

WWTP decommissioning projects have facilitated the reduction in both conventional and nutrient pollutant loading to the Monocacy River and the Chesapeake Bay. To date, Frederick County has decommissioned the following minor WWTPs, diverting their flow to the Ballenger Creek BNR facility.

	Permitted Flow
a. Lake Linganore WWTP (NPDES Permit MD0053376)	(0.400 MGD)
b. Spring Ridge WWTP (NPDES Permit MD0062324)	(0.200 MGD)
c. Pinecliff WWTP (NPDES Permit MD0022888)	(0.010 MGD)
d. Buckingham Hills WWTP (NPDES Permit MD0059382)	(0.028 MGD)
e. Libertytown WWTP (NPDES Permit MD0060577)	(0.050 MGD)
f. Urbana High School WWTP (NPDES Permit MD0066940)	(0.030 MGD)

The County is planning to divert the flow from three additional minor treatment facilities to the Ballenger Creek-McKinney WWTP. These facilities include:

	Permitted Flow
a. New Market WWTP (NPDES Permit MD0020729)	(0.240 MGD)
b. Monrovia WWTP (NPDES Permit MD0059609)	(0.200 MGD)
c. Reich's Ford Road Landfill WWTP (NPDES Permit MD0061093)	(0.097 MGD)

The elimination of these minor WWTPs and the diversion of their flow to the Ballenger-McKinney ENR facility will significantly reduce nutrient point-source contributions to the Chesapeake Bay watershed associated with these facilities. Since these WWTPs are not equipped with any type of nutrient reducing technology, they may discharge nitrogen and phosphorus concentration up to 10 times as much as wastewater treated at Ballenger-McKinney WWTP. The initial 1.0 MGD expansion of the Ballenger-McKinney WWTP has, in part, provided replacement capacity for these decommissioned treatment plants. When the Ballenger-McKinney WWTP is completed, it will be the County's primary ENR WWTP. The phased construction of the project, which includes the construction of a bridge across Ballenger Creek, creates one large single treatment complex that will provide the best available technology to meet ENR treatment requirements. This single facility will initially use the existing Monocacy River outfall, but will also have the ability to divert treated effluent to the Potomac River through a 10.2-mile outfall system. The Potomac River outfall will allow the County to meet the proposed pollutant loading values for the Monocacy River when flow from the facility *exceeds* 15 MGD.

Costs of BMPs

Using the numbers provided by the MAST tool, the County calculated total costs using per unit costs. The section below discusses the source of the cost information, and the cost extension.

Cost of Waste Water Treatment

The Ballenger-McKinney WWTP Facility Plan recommended the construction of improvements to expand the existing 6.0 MGD Biological Nutrient Removal (BNR) treatment facility to 15 MGD, starting with an immediate 1.0 MGD increase in the BNR facility capacity. The 1.0 MGD increase in capacity was designed, permitted and with construction completed in May 2009. Coincident to this initial increase in capacity, the County designed, bid and is now constructing a phased 8.0 MGD increase in Ballenger-McKinney WWTP, which includes ENR levels of treatment for the 15 MGD design capacity (capacity beyond 7.0 MGD).

The existing plant upgrade to Enhanced Nutrient Removal for the Ballenger-McKinney plant is projected to be the main cost to meet TMDL standards, in the budgeted amount of $118,000,000. It is noted that the costs to upgrade this plant include additional capacity. Breakout of costs for the Ballenger McKinney plant:

- State ENR Grant: $30,741,060
- State Loan: $61,000,000
- ARRA Loan: $6,000,000

- Local Funds: City of Frederick: $14,873,944, County: $5,619,844.

Cost of Septic Denitrification

In the case of septic denitrification, staff used an average of costs from four vendors that have systems approved by MDE:

- Singulair TNT: $11,079
- Hoot BNR: $11,954
- AdvanTex AX20: $12,300
- SeptiTech M400D: $13,056.00

The average cost per unit is $12,000. This cost does not include future management costs.

Cost of Stormwater Restoration Programs

MDE provided an analysis of BMP costs on 10/31/2011, which is much appreciated. Frederick County plans to work with these numbers and compare to its own project experience to ultimately predict the cost of the TMDL for stormwater. We have some initial concerns with MDE's estimates.

- Montgomery County estimates $168K-$200K/acre for ESD retrofits, not including land acquisition, but estimates provided by MDE on 10/31/2011 are significantly lower on average. This is likely because MDE did not separate out bioretention for C/D soils that requires soil replacement and underdrains. The geology in most of Frederick County requires this practice.
- It appears that the state has grossly overestimated the cost of an acre of tree planting at $207,207 for several reasons. MDE expects to require 2.6 acres of trees to be planted for every impervious acre treated; we discuss in this publication the faulty reasoning behind this calculation. MDE assumes a high cost per acre of planting inconsistent with our own experience. MDE estimates for the practice include extremely high costs for land acquisition, when this cost is not evenly applied to other BMPs. We appreciate that the publication breaks down costs and allows us to input what we consider to be realistic numbers. We will have to do our own cost analysis based on best available data combined with MDE's analysis to come up with the most efficient strategy.

MDE's Draft Phase II WIP Targets

On March 30, 2011, MDE submitted its draft Phase II WIP to EPA. This draft included scenarios to meet the targets for the WIP at a county scale. If a county did not provide its own scenarios using the Maryland Assessment Scenario Tool, MDE provided a scenario that reduced Nitrogen and Phosphorus to its target levels. MDE's submittal represented a way to address nitrogen and phosphorus targets in a modeled scenario. The information used to develop the MAST scenarios was a technical analysis based on theory using limited information. The scenarios developed by MDE have not been selected or adopted by Frederick County Government or its Board of County Commissioners at this time. The strategies could change substantially in the future as new information becomes available. MDE's "Maryland Phase II WIP Strategies: Frederick" document claims that the Frederick WIP team did submit MAST scenarios, but this is not the case.

40 CFR 122.26 (b) (8)

Municipal separate storm sewer means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

i. Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States;

ii. Designed or used for collecting or conveying storm water;

iii. Which is not a combined sewer; and

iv. Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

On 4/11/2012, Delegate Maggie McIntosh provided an estimate from MDE during the floor fight for HB987 that Frederick County's Stormwater targets for the WIP would cost $200M. She stated that this number came from Jay Sakai of MDE. Staff requested documentation on this cost from Mr. Sakai but did not receive a response. Staff estimated the cost to County taxpayers to be about $181 per tax account per year til 2025 using MDE's $200M estimate and provided this number to the Board of County Commissioners.

Staff briefed Municipal and County leaders on Maryland's Draft Phase II WIP submittal at the County/Municipalities meeting on 4/12/2012.

The Chesapeake Bay TMDL does not have Waste Load Allocations (WLAs) at the local level, but MDE has "targets". The submittal of the WIP, per an article published in the Frederick Gazette by Katherine Heerbrandt on 6/28/2012, is voluntary:

"Submitting the plan is voluntary, the state can impose its own plan on the counties who do not follow through, according to MDE spokesman Samantha Kappalman. "If counties do not submit a plan, they will need to begin implementing strategies listed in the plan that the state has put together for them."

If the state does not meet goals set by EPA, Kappalman said there will be consequences. "We are unsure of exact consequences at this point, but can be anything from limiting future growth capacity at wastewater treatment plants and more within the permit process to ensure growth in existing areas and preserving farms and forest lands," she said.

Tracking, Verification and Reporting

Frederick County Government holds an NPDES MS4 Phase I permit. The County reports all progress on this permit in its Annual Report. As any compliance with the TMDL will be regulated by the permit, the permit reporting should suffice for TMDL compliance with regulated stormwater within the County MS4.

Frederick County Government has wastewater NPDES permits. As any compliance with the TMDL will be regulated by permit, the permit reporting should suffice for TMDL compliance with wastewater within the County.

Septic upgrades with BRF funding are reported to MDE with reporting for that program. Environmental Health also tracks its program outputs for State DHMH and MDE requirements to monitor the number of new lots created for onsite sewage disposal, as well as internal "S Form" reports on the number of new lots created in the fiscal year, septic permits issued, repairs processed for existing systems, repairs completed, number of construction inspections, number of sand mounds installed, etc.

Other reporting mechanisms include Annual Reports to MDP on all Planning and Zoning functions, Comprehensive Plan Updates, and Water and Sewerage Plan

Amendments.

Relationship between Phase II WIP and Local Watershed Planning Frameworks

MDE has proposed significant changes to the County's NPDES MS4 permit to require compliance with the Chesapeake Bay TMDL. These include requirements to assess all TMDL requirements in the first year of the permit, include public participation in TMDL planning, and provide yearly reports on TMDL implementation. The permit also requires the County to assess all watersheds in the permit term. Frederick County believes that the rush to complete TMDL Assessments prior to Watershed Assessments creates duplicate efforts and will also result in a TMDL product that has very little field verification. The County believes that TMDL Assessments should be planned along with Watershed Assessments and Restoration Assessments. Since certain BMPs are more programmatic, such as Urban Nutrient Management, the County can apply those early on to demonstrate significant progress towards meeting the TMDL while taking the time to plan for physical restoration projects. The County is also concerned that a great deal of previous efforts in Watershed Assessment and Restoration Assessment, such as Watershed Restoration Action Strategies, will be tossed aside because of a whole new set of requirements, and we believe this slows TMDL execution rather than speeding it up.

Technical Discrepancies and Future Steps

Technical Discrepancies

Inaccuracy of Models at the Local Level

The Chesapeake Bay Program Model 5.3.2 has serious known inefficiencies and inaccuracies in the following areas that impact the stated loads for Frederick County Government:

- Nitrogen simulation
- Local and segment level allocations
- Septic allocations

The Bay TMDL is calibrated and validated with intersecting datasets, which poses serious questions about its accuracy. Furthermore, the Bay Program model uses very big correction factors to account for areas where local modeling does not add up to downstream loads. This adds additional inaccuracy at a local level. The MAST tool, designed to echo the Chesapeake Bay TMDL, further adds error by splitting loads by jurisdiction, sector, and permit. Our concern is that we do not have an accurate estimation of loads with which to calculate our actual TMDL obligation.

Frederick County has worked with its consultant, Versar, to conduct pollutant load modeling using the EPA SWMM model at a catchment level. This model includes pollutant removal efficiencies from existing Best Management Practices, including restoration projects. Frederick County plans to continue to use this tool, which is more accurate at the local scale, to calculate pollutant loads. The most recent document which documents pollutant loads is "2011 Stormwater Pollutant Model for Watersheds in Frederick County, Maryland", Versar, Inc., August 2011.

Moving Targets

Since Frederick County began to try to build TMDL compliance scenarios using numbers from MDE in April, MDE has issued five official sets of numbers. Frederick County built its scenarios using numbers available in MAST on October 19 and 20, 2011. On November 1, Nan Lyons of MDE issued an email stating that the numbers had changed once again. In conversations with Olivia Devereaux of ICPRB on November 3, the model had to be changed because of the errors in the

previous version; however Frederick County will not have time to redo the scenarios by November 18. The changes are significant. Table 13 illustrates the changes to Stormwater Loads and Goals for Delivered Total Nitrogen over time.

Table 13: Stormwater Load and Goals for Total Delivered Nitrogen, Illustrating Moving Targets

Source	Total Delivered Nitrogen Load	2017 Total Delivered Nitrogen Goal	2017 Total Delivered Nitrogen Reduction	Goal %
MDE's "Summary of Phase I WIP Loads" April 5, 2011	587,038 lbs	511,078 lbs	75,960 lbs	12.9%
MDE MAST Tool September 7, 2011	792,831 lbs	Use above number	281,753 lbs	35.6%
MDE EPA Numbers Due August 15, Issued September 14, 2011	919,443 lbs	858,424 lbs	61,019 lbs	6.6%
MDE MAST Tool October 19, 2011 (Dates scenarios were built)	788,730 lbs	727,711 lbs	61,019 lbs	7.7%
MDE MAST Tool November 1, 2011	927,596 lbs	???	???	???

Frederick County attempted to develop scenarios to meet the TMDL several times, most recently on October 19 and 20. The numbers in the MAST tool were changed on November 1 to correct errors in the tool, and Frederick County will not have the time to create new scenarios by November 18.

Lack of Offsets for Future Growth from Septic and Stormwater Sectors

The Maryland Department of the Environment (MDE)'s Final Phase I WIP submission to the US EPA (December 3, 2010) broadly mentions that policies and programs that account for growth in loads can be adopted "to ensure all future load increases are offset by commensurate load reductions on an as-needed basis." There does not appear to be any mechanism whatsoever in the TMDL to provide offsets for future load increases for septics or stormwater; originally, MDE suggested that these offsets could be bought through an Agricultural Nutrient Trading program, but MDA has since stated that trades in our basin will likely not be available. Proposals to MDE's stormwater program for trading outside of the boundary with NPS projects or with projects in unregulated stormwater have fallen on deaf ears; this prevents the County from finding the most cost-effective solutions to required nutrient reductions, both now and into the future. This suggests no future growth, period.

Implementation Prior to 2009

MDE's MAST tool does not allow for implementation before 2009 to be added to the tool; it appears that implementation after the Chesapeake Bay Program's baseline year gets applied across all counties on average; thus if a county has made significant progress between 2006-2009, this progress is given to other counties, and if no progress was made, the County gets progress from other counties. Frederick County has spent a great deal of effort and funds to address water quality impairments and appears to not get credit for the practices, which screws up our accounting and increases our future liability. Furthermore, we get credit for practices in the critical area without having any portion of

the county in the critical area. This is also an issue for us as we have modeled all of existing BMPs using EPA's SWMM tool.

Atmospheric Deposition of Nitrogen

A significant amount of Nitrogen that is allocated to the Urban Sector is actually from atmospheric deposition (see "CSN Technical Bulleting No. 9. Nutrient Accounting Methods to Document Local Stormwater Load Reductions in the Chesapeake Bay Watershed REVIEW DRAFT" for a discussion). This load should not be part of the urban stormwater load any more than the counties adjacent to the Bay should be responsible for pollution that flows to the Bay from upstream jurisdictions. In light of this, the atmospheric deposition of Nitrogen should be addressed at its source through transportation initiatives to reduce byproducts of incomplete combustion from the burning of fossil fuels. MDE should model Tier III air quality standards for low-sulfur fuels to determine their impacts to nitrogen deposition.

Impacts from "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated"

The "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated" document published in draft by MDE in June 2011 removes approximately 90% of impervious area previously credited for Frederick County. The County is concerned with the policy implications of this document, as it believes that the document will prevent implementation of cost-effective practices. MDE would give full impervious credit to structural practices if they treat a single inch of rainfall but expect nonstructural practices to treat the full loading difference in a land use conversion from urban to forest. This puts non-structural practices, which are generally less costly, at a disadvantage.

The Chesapeake Bay Program counts an acre of urban forest buffers as one acre of land conversion from the urban land use to forest, plus an additional acre of urban land treated with a forest efficiency. The new standards from MDE count an acre of planting as 34% of one impervious acre treated, requiring 2.9 acres to be planted for every acre credited. Though the State suggests it is requiring nonstructural practices to meet the difference of the urban land use and the forested land use to count as 100%, the state has only applied this rule to the acre treated with the BMP efficiency, and not the acre of conversion. Thus the state should credit one acre of tree planting as 1.34 acres according to its own standards. For example, in order to meet 20% retrofitting requirements with tree planting, the County would have to actually retrofit 59% of all eligible urban land. Frankly, this makes no sense. Grass buffers and other nonstructural practices suffer from these new accounting standards. Implementation of these less cost-effective practices becomes less desirable and implementation of the TMDL requirements less practical, and less likely.

Frederick County believes that significantly more implementation for the Chesapeake Bay TMDL will occur if the state reconsiders its accounting for impervious area treatment. If it is to adjust acres treated, it should do so based on pollutant removal efficiencies using the same methods for all practices, and should not try to address flow or other impervious issues at the same time, as they are not the subject of the TMDL.

The "Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated" document is being used to establish policy and is the basis of MDE's new cost study, but it has not received full peer review, is not approved by the Chesapeake Bay Program, and has not had an adequate public review process.

No Ability to Verify Model Assumptions

Assumptions for the MDE allocations, as well as the Chesapeake Bay TMDL and the Chesapeake Bay Program Model are opaque. Without access to the models, it is impossible to determine if their allocations are correct. From the assumptions that are visible, there are significant errors.

No Ability to Correct Assumptions Until 2017

Frederick County is concerned that accurate data available from the County was not used to establish the County's allocations, and there appears to be no mechanism to correct this before 2017 at the earliest.

Overestimation of Septic Loads

The Maryland Department of the Environment (MDE)'s Final Phase I WIP submission to the US EPA (December 3, 2010) cites 18.46 lbs N/yr/hh on septic systems vs. 3.87 lbs N/yr/hh on public sewer.

It appears the MAST estimates may be inconsistent with Plan Maryland estimates, and that both sets of numbers may have assumptions that are not accurate for Frederick County. Staff from Environmental Health analyzed the State's numbers for septics for Plan Maryland and determined that the numbers used for septics came from the Chesapeake Bay Program Model with the lbs/person N and lbs/household N generally acceptable for planning purposes. Regarding household size there may be some minor deviation county-to-county but the Sewer number likely came from MDP's census data; ~2.5 people per home and 250 gallons per day wastewater generated was again a generally accepted planning number/projection. The "50%" delivery rate is open to debate; the Bay model uses 80% delivery for Critical Area (<1000' of tidal waters); 50% for >1000' of tidal waters; and 30% delivery for >1000' of other surface waters. Frederick County would argue for the 30% delivery rate (which would decrease the required load reductions for the County). There are a lot of assumptions in the State's Plan Maryland document, for example that homes on ¼ acre are served by sewer and homes on 2 acres are served by septics. The origin of this assumption is unclear. The outcome of using this assumption is that homes on septics release supposedly 8 times the stormwater pollution of homes on sewer because they have 8 times the area. It is unclear if this acreage is based on real data, if it is a mean or median, and if it is skewed by outlier parcels with large acreages. It would be interesting to look at the median acreages, as larger residential septic properties may be skewing the mean. It appears that MDE's MAST tool is using delivered loads and not edge of stream loads for Septics, which is appropriate; this should be corrected in the Plan Maryland estimates. Good science should prevail in the calculation of the delivery rate and should be consistent between agencies.

No coordination with Local TMDL Planning

Table 14: Stoplight Matrix of Status of Local TMDLs in Frederick County as of October 7, 2011

Watershed	Total Maximum Daily Loads				
	Sediment	**Nitrogen**	**Phosphorus**	**Fecal Coliform**	**Eutrophication**
Chesapeake Bay	Approved	Approved	Approved		
Potomac River	Submitted to EPA	Under Development	Under Development		Submitted to EPA
Lower Monocacy River	Approved	Under Development	Under Development	Approved	
Lake Linganore	Approved		Approved		
Upper Monocacy River	Approved	Under Development	Under Development	Approved	
Double Pipe Creek	Approved	Under Development	Under Development	Approved	
Catoctin Creek	Approved		Under		

			Development		

The numbers provided in the MAST scenarios meet the requirements of the Chesapeake Bay TMDL; however it is unknown at this time if the numbers meet requirements of local TMDLs in Table 14.

Private Property

Frederick County Government cannot commit private property owners to retrofitting their properties. Much of the area that MDE's Science Services Administration includes in the MS4 boundary estimate for Phase I is actually private.

Maximum Extent Practicable

Frederick County is regulated through NPDES permits, which drive compliance with the TMDL. The permits include "Maximum Extent Practicable" provisions which have not been considered in the TMDL process, but will need to be considered in the permitting process. We suggest that an MEP analysis be conducted before Frederick County is held to retrofitting requirements.

Use Attainability Analysis

The Total Maximum Daily Load regulations provide for the Use Attainability Analysis, which determines, among other elements, the management feasibility of TMDL allocations. We suggest that a UAA will be necessary to incorporate economic and technical realities into the TMDL planning process. Thus far, the TMDL analyses have excluded any type of feasibility at the local level, including technical feasibility. At this point, there is no proof of attainability.

No Coordination with Planning and Zoning

The Chesapeake Bay TMDL does not provide allocations for the increased Nitrogen (N) and Phosphorus (P) loads (stormwater and septics) from future land conversions, i.e., land cover change from forest, meadow, etc to residential, industrial or commercial uses.

How are increased N and P loads from septic systems and stormwater that result from new development accommodated through the Watershed Implementation Plan (WIP) process?

Will application of Environmental Site Design to the Maximum Extent Practicable address future increases in pollutant loads from new development? Given MDE and EPA's lack of clear guidance on this, we cannot assume an affirmative response to the aforementioned question.

Promoting medium to high density infill development or redevelopment will result in lower per capita loads than new, large lot, well/septic development and will achieve Smart Growth goals by concentrating growth in established areas that may already be required to restore untreated impervious cover. MDE's Phase I submission also states, "*….areas with high loads per capita would need to offset loads to a higher degree than areas with low loads per capita."*

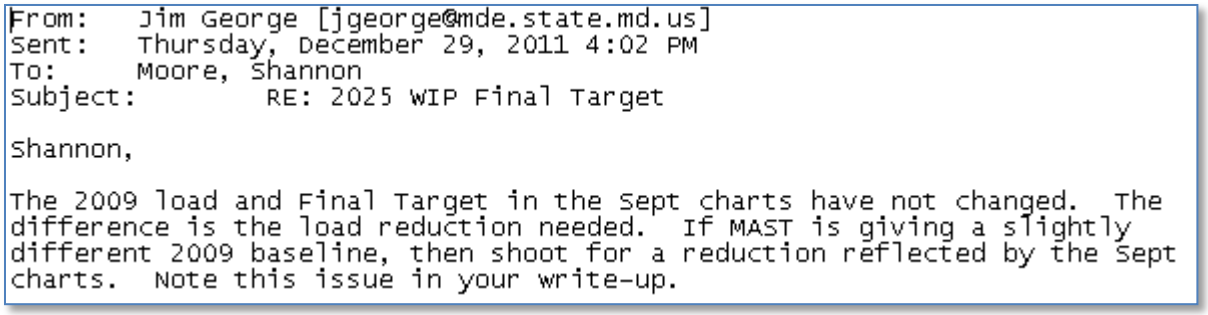
Future Plans

Frederick County remains committed to the protection of the Chesapeake Bay and to water quality in its local waterways. The County has its goals mandated through NPDES permits and State requirements. The County will continue its efforts to meet the regulatory requirements in support of these goals:

- Define the MS4 boundary according to the Clean Water Act;
- Work with MDE to develop the next NPDES MS4 permit and comply with the permit;
- Develop estimates of the level of implementation required to meet the permit and a BMP strategy;
- Work towards the implementation of the Chesapeake Bay TMDL.

Appendix C: Reductions by Source Sector

The loads in the MAST tool change on a regular basis, so determining a final load based on a fixed reduction is an impossible process. Per an email from Jim George at MDE dated December 29, 2011, we are to use the updated loading numbers in MAST and subtract the fixed reduction in the September 14 submission that MDE made to EPA to determine if MAST scenarios meet the goals for 2017 and 2025. We have continued to use the reduction numbers calculated from this publication as the reduction goals for the WIP in lieu of new guidance. The tables from the publication are reproduced from MDE's September 14 submission to EPA in Figures 2 and 3 on the following pages for pounds of nitrogen and phosphorus, respectively.



From: Jim George [jgeorge@mde.state.md.us]
Sent: Thursday, December 29, 2011 4:02 PM
To: Moore, Shannon
Subject: RE: 2025 WIP Final Target

Shannon,

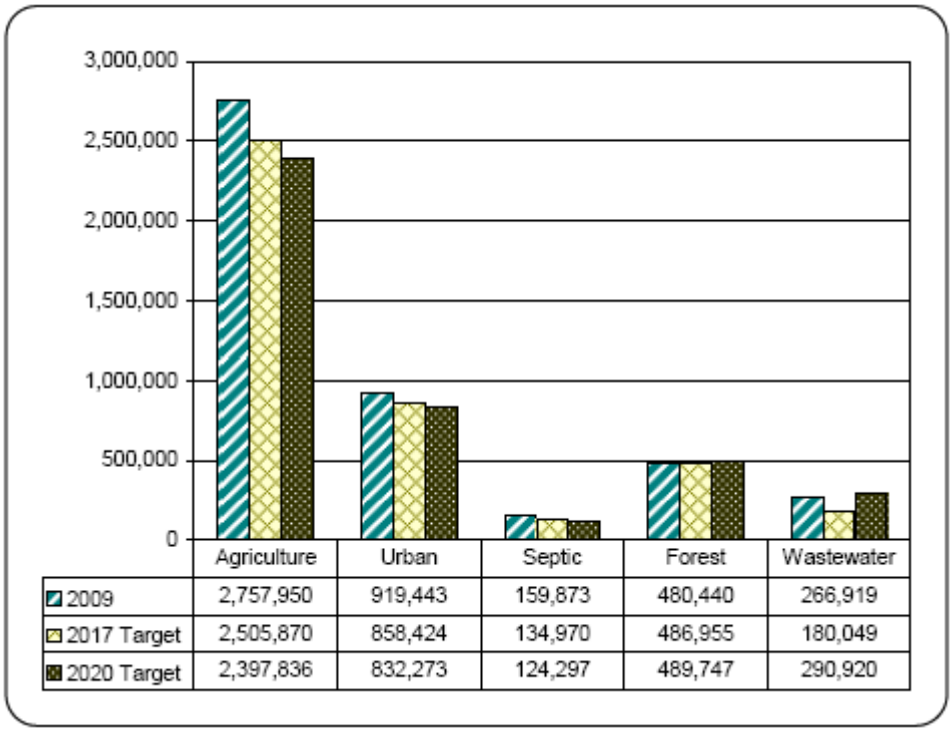
The 2009 load and Final Target in the Sept charts have not changed. The difference is the load reduction needed. If MAST is giving a slightly different 2009 baseline, then shoot for a reduction reflected by the Sept charts. Note this issue in your write-up.

Figure 1: Email from Jim George Recommending that the County Use MDE's Submission to EPA Dated September 14, 2011 to Determine Nutrient Reductions

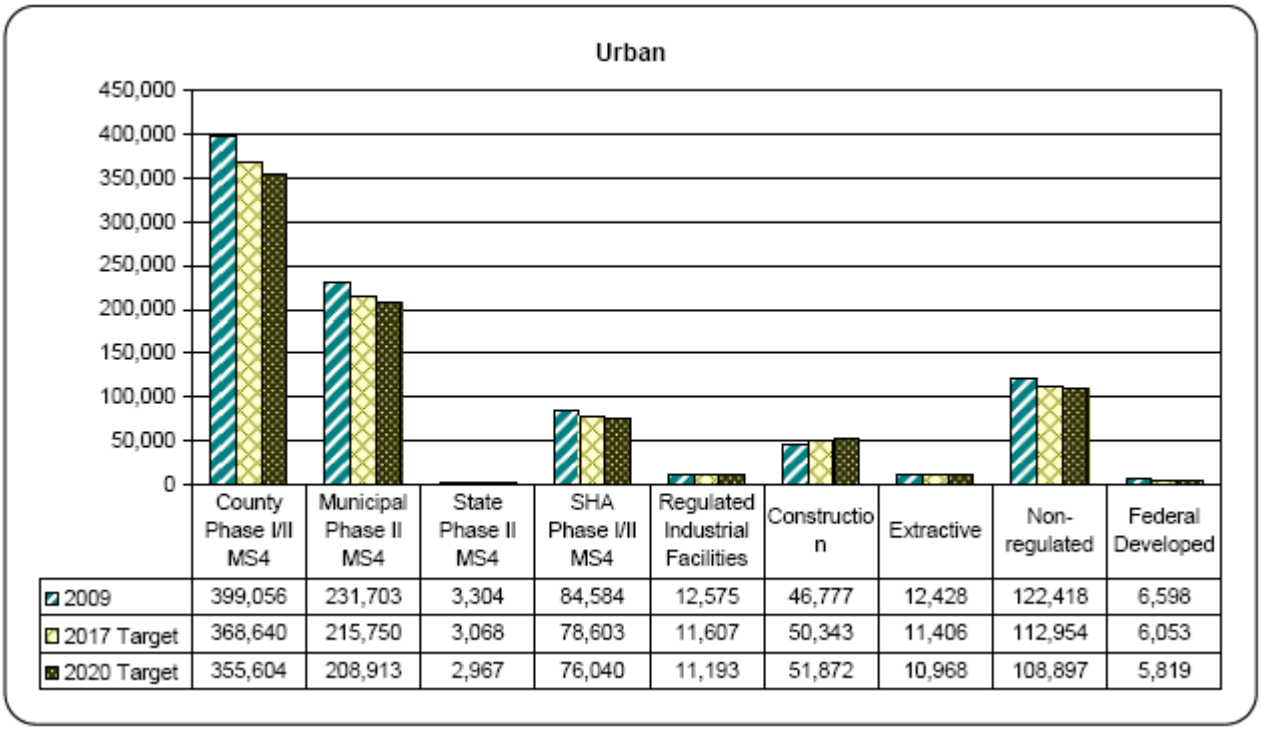
Table 15 below reflects the reduction numbers calculated from the publication for Frederick County's NPDES Phase I MS4 permit Note that MDE's "Maryland Phase II WIP Strategies: Frederick" scenario uses these reduction numbers.

Table 15: MDE's Reduction Targets for Frederick County's Phase I NPDES MS4 Permit for Nitrogen and Phosphorus by 2017 and 2025 from September 14, 2011 publication

	2017	2025
Nitrogen Reduction (pounds)	26,071.2	43,452
Phosphorus Reduction (pounds)	2,197.2	3,662

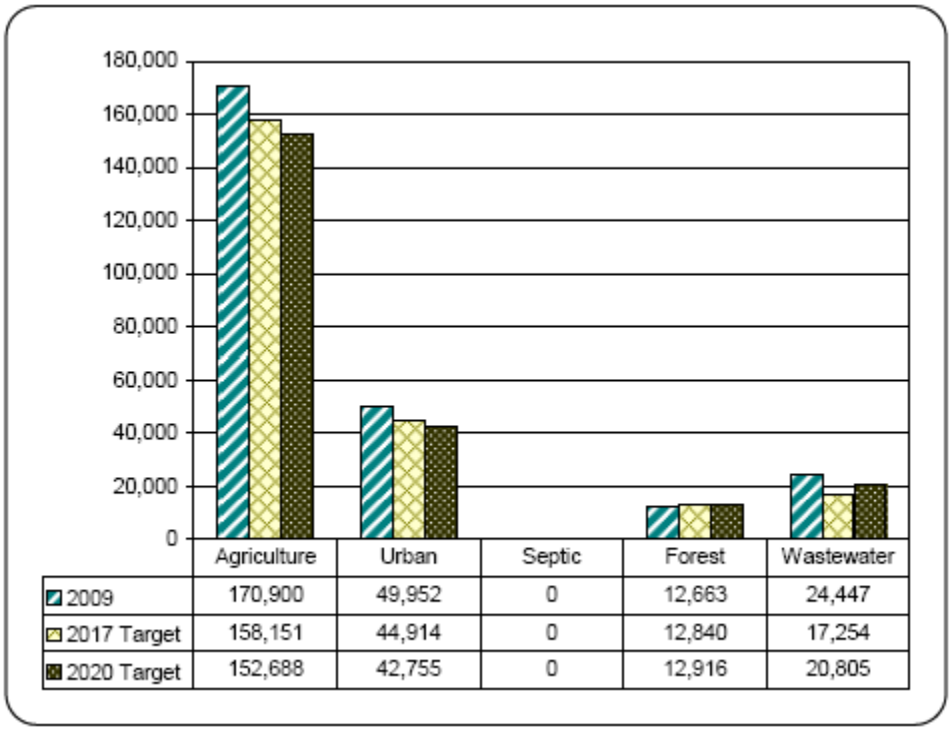


	Agriculture	Urban	Septic	Forest	Wastewater
2009	2,757,950	919,443	159,873	480,440	266,919
2017 Target	2,505,870	858,424	134,970	486,955	180,049
2020 Target	2,397,836	832,273	124,297	489,747	290,920

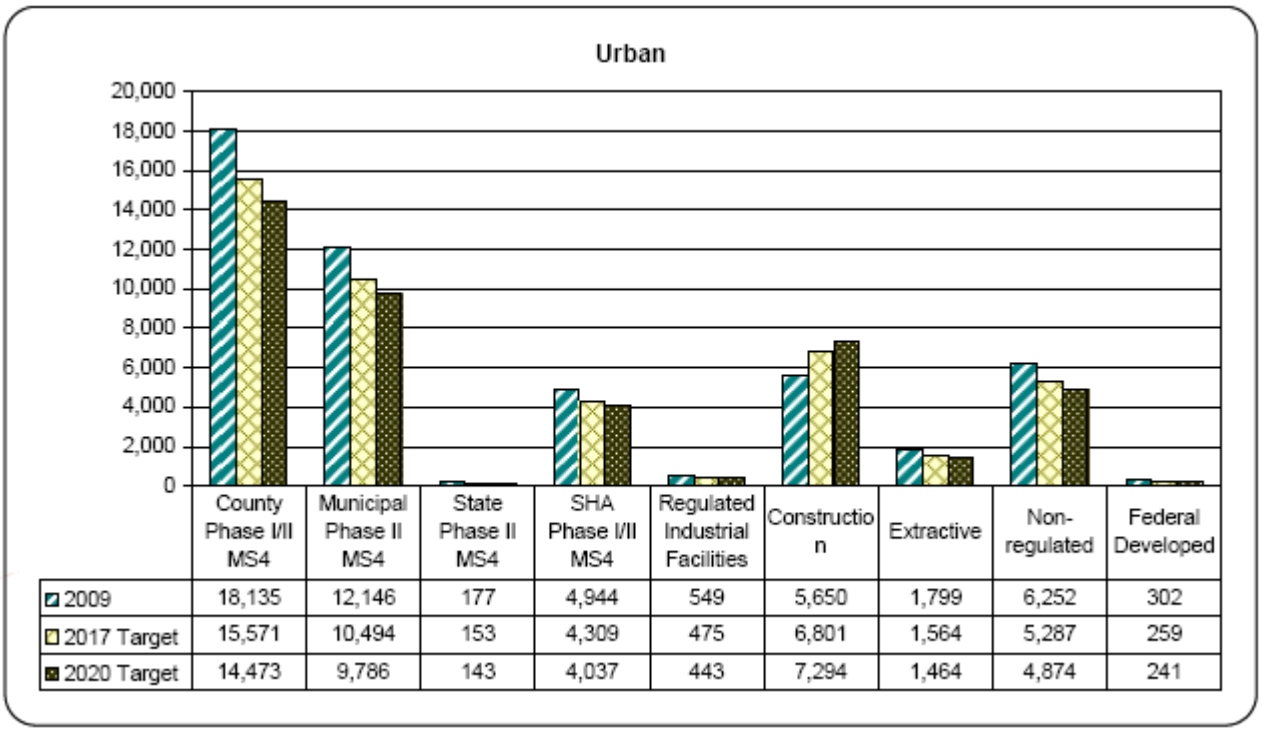


	County Phase I/II MS4	Municipal Phase II MS4	State Phase II MS4	SHA Phase I/II MS4	Regulated Industrial Facilities	Constructio n	Extractive	Non-regulated	Federal Developed
2009	399,056	231,703	3,304	84,584	12,575	46,777	12,428	122,418	6,598
2017 Target	368,640	215,750	3,068	78,603	11,607	50,343	11,406	112,954	6,053
2020 Target	355,604	208,913	2,967	76,040	11,193	51,872	10,968	108,897	5,819

Figure 2: Phase 2 - Frederick (Non-Federal & Federal) Total Nitrogen Loads, Delivered from MDE's submission to EPA September 14, 2011



	Agriculture	Urban	Septic	Forest	Wastewater
2009	170,900	49,952	0	12,663	24,447
2017 Target	158,151	44,914	0	12,840	17,254
2020 Target	152,688	42,755	0	12,916	20,805



	County Phase I/II MS4	Municipal Phase II MS4	State Phase II MS4	SHA Phase I/II MS4	Regulated Industrial Facilities	Construction	Extractive	Non-regulated	Federal Developed
2009	18,135	12,146	177	4,944	549	5,650	1,799	6,252	302
2017 Target	15,571	10,494	153	4,309	475	6,801	1,564	5,287	259
2020 Target	14,473	9,786	143	4,037	443	7,294	1,464	4,874	241

Figure 3: Phase 2 - Frederick (Non-Federal & Federal) Total Phosphorus Loads, Delivered (from MDE's submission to EPA September 14, 2011)

Appendix D: Unit Costs from King and Hagan

Use of Planning Level Unit Stormwater BMP Costs with MAST Output to Compare WIP Alternatives

Planning Level Unit Cost Development for Stormwater Best Management Practices (BMPs)
Part 4: Integrating Unit Stormwater BMP Costs with MAST Output

Stormwater BMP		Reduction in Emissions per acre treated by each Stormwater BMP (1) Nitrogen	(2) Phosphorus	(3) Sediment	(4) Available Acres	(5) % of Available Acres Treated (County Decision Variable)	(6) Number of Acres Treated	Cost per Impervious Acre Treated: County-based Costs (7) Initial Cost	(8) Average Annual Maintenance Cost	Lifetime Costs (9) Total (Over 20 Years)	(10) Annual Costs (Over 20 Years)
Impervious Urban Surface Reduction							0	$ 146,250	$ 885	$ 163,957	$ 8,198
Urban Forest Buffers							0	$ 33,000	$ 1,210	$ 57,207	$ 2,860
Urban Grass Buffers							0	$ 23,650	$ 870	$ 41,057	$ 2,053
Urban Tree Planting							0	$ 183,000	$ 1,210	$ 207,207	$ 10,360
Wet Ponds and Wetlands (New)							0	$ 26,115	$ 763	$ 41,368	$ 2,068
Wet Ponds and Wetlands (Retrofit)							0	$ 65,998	$ 763	$ 81,251	$ 4,063
Dry Detention Ponds (New)							0	$ 44,000	$ 1,231	$ 68,620	$ 3,431
Hydrodynamic Structures (New)							0	$ 42,000	$ 3,531	$ 112,620	$ 5,631
Dry Extended Detention Ponds (New)							0	$ 44,000	$ 1,231	$ 68,620	$ 3,431
Dry Extended Detention Ponds (Retrofit)							0	$ 72,500	$ 1,231	$ 97,120	$ 4,856
Infiltration Practices w/o Sand, Veg. (New)							0	$ 63,450	$ 866	$ 80,770	$ 4,039
Infiltration Practices w/ Sand, Veg. (New)							0	$ 66,250	$ 906	$ 84,370	$ 4,219
Filtering Practices (Sand, above ground)							0	$ 54,000	$ 1,431	$ 82,620	$ 4,131
Filtering Practices (Sand, below ground)							0	$ 56,000	$ 1,631	$ 88,620	$ 4,431
Erosion and Sediment Control							0	$ 26,000	$ 10	$ 26,207	$ 1,310
Urban Nutrient Management							0	$ 61,000	$ 31	$ 61,620	$ 3,081
Street Sweeping							0	$ 6,049	$ 451	$ 15,079	$ 754
Urban Stream Restoration							0	$ 64,500	$ 891	$ 82,320	$ 4,116
Bioretention (New - Suburban)							0	$ 49,875	$ 1,531	$ 80,495	$ 4,025
Bioretention (Retrofit - Highly Urban)							0	$ 186,750	$ 1,531	$ 217,370	$ 10,869
Vegetated Open Channels							0	$ 26,000	$ 610	$ 38,207	$ 1,910
Bioswale (New)							0	$ 44,000	$ 931	$ 62,620	$ 3,131
Permeable Pavement w/o Sand, Veg. (New)							0	$ 239,580	$ 2,188	$ 283,347	$ 14,167
Permeable Pavement w/ Sand, Veg. (New)							0	$ 335,412	$ 3,060	$ 396,603	$ 19,830
Overall reduction for all Stormwater BMPs		0	0	0							
Cost for all Stormwater BMPs										$ 2,539,274	$ 126,964
Cost per County Resident										#DIV/0!	#DIV/0!
Cost per County Household										#DIV/0!	#DIV/0!
Total Cost per 1,000 sq ft Impervious Area										#DIV/0!	#DIV/0!
County Population (2010)	0										
Number of Households (2010)	0										
Impervious Area (2010)	0										

Source: Dennis King's Presentation at final WIP Phase II Workshop, Salisbury, MD 9/30/11

Source: Stormwater Treatment in Maryland: County Planning-Level Costs, Benefits, and Financing Options by Dennis King and Patrick Hagan. Based on a report prepared for: Maryland Department of Environment Science Services Administration by Dennis King and Patrick Hagan, University of Maryland Center for Environmental Science with contributions by Ali Abbasi, EA Engineering, Science and Technology, Inc.

Appendix E: Responses from MDE Technical Staff to Questions from Shannon Moore

MDE NOTE: For #1, 3, and 4 (and in general): Keep in mind that for the SW BMPs only those that had the minimum information could have been reported to CBP and part of 2010 Progress. The minimum is BMP Type (e.g., Wetpond), Location info, As_Built Date, Area Draining to BMP.

1) Does the 2010 progress scenario include BMPs installed after 2005 but before 2010?

2010 Progress includes all annual practices reported from 7/1/09 - 6/30/10, and all cumulative practices prior to 6/30/10

2) Should we be adding in the first 10% of retrofits from our NPDES MS4 permit that comprises part of the 30% required by the WIP? At what point do we add new practices?

Technically, if you have practices reported prior to the above deadline, then they should be included and anything after that becomes part of the WIP strategy.

3) The numbers for existing BMP implementation appear to be an aggregate number that is proportioned across different land uses. Where do these numbers come from?

They come from MS4 reports and are apportioned to different land uses according to CBP definitions.

4) What happens if the BMP numbers in MAST do not match our BMP numbers we have reported to MDE or even come close?

Then we'll need to work together to help us create an accurate accounting of your BMPs. There are several reasons why they may not match and going through the process of how progress is created may help to gain insight into the discrepancies.

5) The MS4 Permit-required retrofit in MAST in the 2010 Progress scenario is spread across impervious as well as pervious land, and on MS4 Phase I as well as Phase II, unregulated, and industrial, to name a few. This appears to mean that some MS4 retrofits have already been included in MAST. Which ones? Also, MS4 permit retrofits have only been required for impervious area on Phase Is to date. Why is the implementation spread across land uses?

2010 Progress includes all SWM retrofits reported by WMA, based on the County's annual MS4 reports. The retrofits are those which the county has reported to WMA, translated as the generic MS4 permit required BMP.

While the permit requires a level of stormwater management controls based on the retrofit of a percentage of previously untreated or minimally treated impervious surface area, MAST, like the Bay Model, applies the acres treated to urban developed land without distinction between pervious and impervious.

Appendix F: Fort Detrick Input to Frederick County and Maryland Department of Environment Watershed Implementation Plan Phase II [From Draft Phase II WIP Submission]

I. Fort Detrick

Fort Detrick is a U.S. Army Garrison (USAG) managed by the U.S. Army Installation Management Command. Fort Detrick includes non-contiguous land parcels designated as Areas A, B and C. Area A is approximately 730 acres in area and is the most developed portion of Fort Detrick. Area A includes the U.S. Army Garrison offices, most of the infrastructure and support facilities, housing areas, and a majority of the tenant or mission partners' offices and facilities. Area B is situated west-southwest of Area A and west of Rosemont Avenue. Area B is approximately 400 acres in area and contains most of the installation's unimproved or semi-improved land. Pastures and forest blocks are the predominant features in Area B, although it also includes a limited number of tenant facilities. Area B is primarily utilized for agricultural research and animal grazing and maintenance. This area is primarily surrounded by tract development. Area B also contains the Fort Detrick Municipal Landfill. Area C is classified as industrial and consists of two small parcels located along the west bank of the Monocacy River, approximately 1 mile east of Area A. The northern tract of Area C is approximately 7 acres in area and contains the Fort Detrick water treatment plant (WTP). The southern tract lies one quarter mile downstream from the WTP, is approximately 9 acres in area, and contains the Fort Detrick wastewater treatment plant (WWTP). Areas A, B, and C, are located within Frederick County, Maryland. Within Frederick County, Fort Detrick-Frederick encompasses approximately 1,212 acres. The USAG, Fort Detrick, has command and control of approximately 1,143, and the National Cancer Institute at Frederick (NCI-Frederick) has command and control of approximately 69 acres. The NCI-Frederick is "on" Fort Detrick, yet it is not on Army-controlled land. USAG also has command and control of the Forest Glen Annex (132 acres) and Glen Haven Housing Area (20 acres) in Montgomery County, Maryland. Forest Glen Annex (Walter Reed Hospital Annex) provided input in a separate document because it is identified as a separate entity by the U.S. EPA and it is located in a different county. No urban acreage was identified at the Glen Haven Housing Area.

Fort Detrick is located within the Monocacy River drainage basin, a sub-basin of the Middle River Potomac basin and is within the subwatershed POTTF_MD. The Monocacy River basin covers approximately 800 square miles within the 14,000 square mile Potomac River watershed. The Monocacy River originates at the Maryland-Pennsylvania border and flows southerly to the east of Fort Detrick, and is the largest tributary of the Potomac River, which in turn is the second largest tributary of the Chesapeake Bay. Several major streams (Carroll Creek, Tuscarora Creek) are located in the vicinity of Fort Detrick and flow to the Monocacy River. Fort Detrick's subwatersheds include Carroll Creek and the Monocacy River.

The USAG, Fort Detrick provides sustainable base operations support, quality of life programs, and environmental stewardship to facilitate the sustainment of vital national interests. The USAG, Fort Detrick supports five cabinet-level agencies: The Department of Defense, Department of Veteran Affairs, Department of Agriculture, Department of Homeland Security and Department of Health and Human Services. Within the DoD, Fort Detrick supports elements of all four military services. The primary missions of Fort Detrick-Frederick include biomedical research and development, medical logistics and materiel management, and global DoD telecommunications. Fort Detrick-Frederick is home to the U.S. Army Medical Research and Materiel Command (USAMRMC), the National Interagency Confederation for Biological Research (NICBR), the NCI-Frederick, and 37 other mission partners.

II. Fort Detrick Baseline Loadings November 2011*

Municipality: Fort Detrick
County: Frederick County
Total Urban Acres identified by MDE located in Frederick County: 396

Table 16: Urban Land Initial and Current Loads and Urban Reductions Required and Achieved from MDE Reduction Calculator

Initial Loads (lbs)				
2010 No Action Urban Land use acres	2010 No Action Total Nitrogen Load EOS	2010 No Action Total Phosphorus Load EOS	2010 No Action Total Nitrogen Load DEL	2010 No Action Total Phosphorus Load DEL
396	8,570	481	5,038	225
After Implementation (lbs)				
Urban Land use acres	Total Nitrogen Load EOS	Total Phosphorus Load EOS	Total Nitrogen Load DEL	Total Phosphorus Load DEL
396	7,016	349	4,125	164
Urban Reduction Required			**Urban Reduction Achieved**	
2020 Total Nitrogen Load Allocation (DEL)	2020 Total Phosphorus Load Allocation (DEL)		2020 Total Nitrogen Load Allocation	2020 Total Phosphorus Load Allocation
4,031	154		4,125	164
Percent Reduction from Baseline (%)			**Percent reduction Achieved (%)**	
Nitrogen	Phosphorus		Nitrogen	Phosphorus
20	32	Percent Urban Area Treated	18	27
URBAN BMP IMPLEMENTATION				
Tree Planting		0		
Urban Nutrient Management		76		
Filtering Practices		2		
Infiltration Practices		0		
Wet Ponds		25		
Dry Extended Detention Ponds		0		
Dry Ponds		4		
"Retrofit BMP"		0		

**Although there was a TSS allocation in the spreadsheet, since phosphorus tends to bind to sediments, no calculator was provided to DoD for meeting the TSS allocations. We are operating under the assumption that the TSS allocations will be achieved via the required reductions for phosphorus and subsequent BMP implementation (MDE response).*

III. Fort Detrick Programmatic Two Year Milestones 2012-2013

AGRICULTURAL

Fort Detrick has experimental agricultural lands and lands dedicated to boarding of animals. Fort Detrick contains several areas used for animal boarding. Animal litter and bedding (approximately 5% manure, 95% bedding) is the only fertilizer used on these fields, which is applied about three times per year. Fort Detrick boards a variety of grazing animals, including goats, horses, and alpaca. For all of these boarded animals, agricultural pasture land use is considered a nonpoint source.

URBAN STORMWATER MANAGEMENT RETROFITS

Fort Detrick participated in the "Army Chesapeake Bay Total Maximum Daily Load Pilots", which was completed under the National Defense Center for Energy and Environment (NDCEE). Under this Task, a TMDL Baseline Assessment was completed for Fort Detrick to identify and document all TMDL-relevant data. This Baseline Assessment documented/confirmed land use categories and activities that would be relevant to the TMDL. The results of this assessment are documented in the "Final TMDL Baseline Assessment Report for Fort Detrick" (August 19, 2011). In addition, this Task created an inventory of current Best Management Practices (BMPs) in place at Fort Detrick, which includes their geographical locations, the treatment areas for the BMPs, and detailed descriptions for type of BMP. The results of this BMP inventory and assessment are documented in the "Final Watershed Implementation Plan Model and TMDL Monitoring Strategy for Fort Detrick" (August 23, 2011).

SEPTIC SYSTEM UPGRADES

Fort Detrick has a major wastewater treatment plant (WWTP) which services a majority of the installation. There are six septic systems that contain either holding tanks or leach fields at Fort Detrick. Most of these septic tanks are pumped on an on-call or as needed basis, although the Area B tanks are used and pumped less often.

WASTEWATER TREATMENT PLANT DATA

The Fort Detrick WWTP (NPDES permit MD0020877) is located on a 9-acre tract of Area C, on the west bank of the Monocacy River. As part of the NPDES permit, monitoring (Outfall 001) is required for various TMDL-relevant parameters, including total suspended solids (TSS), total Kjeldahl nitrogen (TKN), and TP twice per week, as well as TN, ammonia, nitrite plus nitrate, organic nitrogen, and ortho-phosphorus twice per month. The monitoring results are documented in Discharge Monitoring Reports (DMRs), which are submitted monthly to MDE. The WWTP is one of 68 significant WWTPs in Maryland based on capacity and as such, is subject to the Enhanced Nutrient Removal (ENR) goals of the 2000 Chesapeake Bay Agreement. The WWTP was upgraded (July 2011) to include Enhanced Nutrient Reduction and is discharging IAW with the permit limits.

PROGRAMMATIC 2-YEAR MILESTONES

Fort Detrick has funded the following three projects:

- Identification of potential stormwater BMPs at Fort Detrick and Forest Glen to improve water quality
    - This project will expand on the BMP assessment already completed at Fort Detrick, by providing a Concept Plan that will evaluate the feasibility of implementing water quality improvements, in the form of BMPs, to minimize pollutants discharged in stormwater runoff. The Plan will include concept designs of the BMPs with costs and maintenance schedules. The Concept Plan completion date is March 10, 2012.
- Preparation of Federal Facility Opportunity Assessments for Fort Detrick and Forest Glen
    - This project is to develop a Federal Facility Opportunity Assessment for Fort Detrick and Forest Glen Annex. This document will be prepared in accordance with the April 2011"Guide for Federal Lands and Facilities' Role in Chesapeake Bay Jurisdictions' Phase II Watershed Implementation Plans". The project completion date is September 30, 2012.
- Preparation of a Storm Water Master Plan for Areas A and B at Fort Detrick.

- This project is to develop a Storm Water Master Plan that covers Areas A and B at Fort Detrick to establish a revised baseline for stormwater management planning and to streamline compliance with MDE stormwater regulations, as well as the ongoing TMDL efforts.

IV. Successes

- Fort Detrick has developed an inventory of its existing BMPs, and has collected the necessary information to determine the current loads as required for the Chesapeake Bay TMDL. Funding has already been committed to three TMDL-related projects, which will expand on the previous TMDL efforts completed at Fort Detrick, in order to provide conceptual designs for future BMPs; to develop a document which communicates TMDL-related information to the regulatory community; and, to develop a Storm Water Master Plan which will maintain all stormwater data in one central location, which will assist Fort Detrick in achieving compliance with the recent Chesapeake Bay TMDL regulations.

V. Challenges

- The land use data provided by the Phase 5.3 Model is of a broad nature and does not contain the detail that is representative of the actual land use data available for Fort Detrick. The broad resolution of Phase 5.3 Model land use designations often results in inaccurate land use data.
- The MDE Reduction Calculator does not account for a street sweeping BMP and simplifies reduction efficiencies. Reduction efficiencies vary with parameter, soil type, and underdrain presence and this is not captured by the Reduction Calculator.
- Funding for projects needed to reduce loading from the garrison is contingent upon authorization and appropriation of funds in accordance with appropriate statutes. This includes the U.S. Congress, Department of Defense, Department of the Army and the Army's Installation Management Command. Fort Detrick will be competing for funding against all of the Army's other requirements and there is no guarantee that funding will be available. Fort Detrick will make every effort to obtain necessary funding, but changes in priorities or budget constraints would mean a project or projects may not be executed as planned. Funding is expected to be exceptionally lean in fiscal years 2012 and 2013.

VI. Inaccuracies

- In calculation of the BMP treatment area land use, the facility specific GIS landuse information was used instead of the Phase 5.3 Model land use which cannot be geospatially analyzed. However, in the case of urban nutrient management, a ratio of pervious urban land treated using the facility specific GIS landuse information was used to represent treated acreage.
- Several BMPs entered in the Urban_Summary_Sheet of the Reduction Calculator also treat some non-urban acreage. Therefore the total treated acreage and reductions are higher than shown in the Reduction Calculator, which only considers urban acreage.
- Work recently completed at Fort Detrick to complete an inventory of current BMPs categorized the existing BMPs into those installed in 2005 to 2011 and those installed in 1985 to 2004. Only the urban acres treated for BMPs installed in 2005 to 2011 were added to the “Percentage Applied” section of the Urban_Summary Sheet of the MDE Reduction Calculator. It was assumed that the “Current BMP Acres” tab in the MDE Reduction Calculator was meant to capture the BMPs installed in 1985 to 2004, however the 53.1 acres of wet pond and wetland is not accurate. For the BMPs installed in 1985 to 2004, Fort Detrick actually installed and maintains the BMP types listed in the table below. Total treated urban acreage only is shown even though several of these BMPs treat non-urban acreage as well.

Table 17: BMPs Installed and Maintained by Fort Detrick

BMP Type	Pervious Urban Acres Treated	Impervious Urban Acres Treated
Dry Ponds/Stormceptors	26.97	47.63
Filtering	32.8	137.2
Wet Pond/Wetland	28.7	55.5

- The reduction calculator includes 53.1 acres of Wet Ponds and Wetland acres. Per guidance from MDE, the 53.1 acres were subtracted from Wet Ponds acres identified for the period of 2005 to 2011. The lack of resources to identify the BMPs inputs used in the model calibration leads to inaccuracies in the reduction calculations.

Appendix G: Frederick Armory (24A99, CPT Michael Cresap Armory) Input to Maryland Department of Environment Watershed Implementation Plan Phase II DRAFT

I. Frederick Army National Guard Armory

Frederick Armory (24A99, CPT Michael Cresap Armory) is located in Frederick County, Maryland. The 13.80 acre facility is located on Old National Pike near the west bank of the Monocacy River. Runoff from the site sheet flows into a large grass area surrounding the entire site.
Based upon field reconnaissance, 17-percent of the 13.80 acre site (2.33 acres) is categorized as low intensity impervious urban land cover. This includes building rooftops, roads, parking areas, and sidewalks. 76-percent of the site (10.44 acres) is categorized as low intensity pervious urban land cover, or lawns. 5-percent (0.75 acres) of the site are forested, and the remaining 2-percent (0.28 acres) is unfertilized grass, or brush.

II. Frederick Armory Baseline Loadings November 2011

To be determined.

III. Programmatic Two Year Milestones 2012-2013

- **Agricultural-** Not Applicable.
- **Stormwater Management Retrofits-** There are no existing stormwater BMPs at this site based upon field reconnaissance. Retrofit opportunities will be determined after baseline loadings are established.
- **Septic System Upgrades-** Not Applicable.
- **Wastewater Treatment Plant Data-** Not Applicable.
- **Accounting for Future Growth**-
  - The Frederick Armory will continue to support Maryland Department of Environment (MDE) Watershed Implementation Plan (WIP) Phase II processes in 2012 and 2013.
  - The Frederick Armory will continue to implement the Army Policy for Sustainable Design and Development (SDD), October 2010 and Low Impact Development (LID) under the Energy Independence and Security Act of 2007 (EISA) as a means to manage stormwater for all future construction and maintenance projects. Currently there are no new construction projects scheduled through 2018.

IV. Successes

The WIP Phase II process required collaborative involvement from MDE, the Frederick Armory and the U.S. Army Corps of Engineers to ensure pollutant load reductions as well as current and future BMP implementation levels fulfill the federal share of the needed reductions for Nitrogen, Phosphorous and Sediment pollutants. In an effort to meet WIP Phase II timelines, two year milestones and critical progress milestones in 2017 and 2020, Frederick Armory successfully conducted a comprehensive assessment of boundary data and land use/land cover data on the facility to ensure the data listed below was accurate and submitted to MDE in a timely manner. Providing more accurate data will enable the facility to better assess the load runoff and appropriate BMPs for minimizing or reducing the loads.

- Accurate latitude and longitude locations for each BMP (no BMPs located at Frederick Armory)
- Number of acres treated for each BMP (Not Applicable)
- Date of BMP installation (Not Applicable)
- Condition of BMP (Not Applicable)

MDE and the Services held several meetings. The meetings were helpful and productive. Going forward this federal-state-local partnership will prove to be instrumental in meeting the long term restoration plan for the Chesapeake Bay as well as improve credibility and accountability for Department of Defense (DoD), a Federal agency leading by example.

V. Challenges

- Coordination with multiple Bay jurisdictions made it difficult to apply one agency approach to meeting the required load reductions. For the Services this required additional resources in order to understand what each jurisdiction's expectations are, and these inconsistencies may result in long term load inaccuracies when determining whether TMDL goals have been met across the watershed.
- It was critical that all boundary and land use cover be verified. Facilities of this size have limited GIS data. Therefore, it took an additional amount of resources and technical capability to create shapefiles in order to verify boundaries and land use data.

VI. Inaccuracies

- MDE uses a site size of 14.05 acres while the actual size of the site is 13.80 acres.
- The percentage of impervious cover on the site being used by MDE as well as the type of impervious land (high intensity vs. low intensity) is inaccurate based upon field reconnaissance. MDE lists 1.17 acres of high intensity impervious urban land on the site, when the actual acreage is 2.33 of low intensity impervious urban land. These inaccuracies could result in changes to the expected load reductions.